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RAMAKRISHNAN (T. S.) & RAMAKRISHNAN (K.). **Chaconia tectonae Ramakrishnan T. S. & K. sp. nov. on Teak.**—*Indian Phytopathology*, 2, 1, pp. 17–19, 3 figs., 1949. [Received June, 1950.]

From October to February teak leaves in the forests of Malabar and Coimbatore are commonly affected by a rust described as *Chaconia tectonae* n.sp. The lower surfaces are bright yellow to orange due to the formation of numerous minute uredo- and teleutosori, while the upper surfaces are often grey [cf. *R.A.M.*, 28, p. 553]. The orange, waxy, subepidermal, erumpent, paraphysate teleutosori are mixed with the uredosori. The unicellular cylindric-clavate or fusiform teleutospores are 32 by 7 (22 to 40 by 4 to 11) μ.

In a footnote added after the paper was sent to press, the authors refer to Dr. M. J. Thirumalachar's description of this rust as *Olivea tectonae* [loc. cit.]. They are of the opinion that the rust must be placed in the genus *Chaconia*, in spite of the presence of paraphyses, because of the subepidermal development of the sori. *Olivea* has subcuticular sori.

GRIFFIOEN (K.). **Some wood-destroying fungi of Indonesia.**—*Tectona*, 39, 4, pp. 348–367, 1949.

This work has already been noticed from another source [*R.A.M.*, 29, p. 188].

BIRAGHI (A.). **Nuovi ospiti di Endothia parasitica.** [New hosts of *Endothia parasitica*.] —*Ann. Sper. agr.*, N.S., 4, 1, pp. 109–118, 9 figs., 1950. [English summary.]

In 1948 the author received from Rossiglione, near Genoa, where chestnut canker (*Endothia parasitica*) [*R.A.M.*, 29, pp. 129, 440, and next abstract] has long been present, material of *Quercus sessiliflora* and *Q. pubescens*, and from Avellino *Q. ilex*, all of which in culture gave *E. parasitica* [cf. ibid., 26, p. 137]. Inoculations of chestnut trees with the organism from oak gave typical symptoms of canker, though two months later than strains of the fungus from chestnut. Some of the examples of oak canker examined showed clearly that the fungus was a primary parasite, while in others the host appeared to have sustained some previous injury. The author's inoculation experiments appear to indicate that the fungus, after passing from chestnut to oak, requires a certain period in which to become actively established in the latter host, but once this critical period is over it becomes definitely parasitic. Further investigations are in progress.

ORSENIGO (M.) & BONCOMPAGNI (T.). **Nota preliminare sui trattamenti antisporulanti nell' eradicazione del cancro del Castagno da Endothia parasitica.** [Preliminary note on treatments for the arrest of spore formation during the eradication of Chestnut canker due to *Endothia parasitica*.]—*Notiz. Malatt. Piante, 1950*, 10, pp. 52–57, 1950. [Mimeographed.]

As one of the chief drawbacks to the control of chestnut blight (*Endothia parasitica*) [see preceding abstract] by eradication or tree surgery is that either method

favours the dispersal of viable pycnidiospores, the authors carried out an experiment to ascertain whether pycnidiospore formation could be arrested. Chestnut trees in a severely affected area at Mompiano, Brescia, were sprayed with various fungicides in oil. Five days later pieces of treated bark were removed and placed in a damp chamber for 13 days, when it was found that of the 20 trees treated with elgetol at 8 and 12 per cent. only four formed fresh pycnidia, as against four out of five of the untreated and 54 out of 61 for the other treatments. Germination of pycnidiospores on potato agar at 24° C. after the elgetol treatments showed that 71·4 and 66·6 per cent., respectively, were alive as compared with 100 per cent. for the untreated and 91·6 to 100 per cent. for the other treatments. Further work is in progress.

Reichert (I.) & Chorin (Matilda). **A rust disease of Aleppo Pines in Palestine.**—*Palest. J. Bot.*, R. Ser., 7, 1–2, pp. 135–141, 1 pl. (facing p. 144), 1949. [Hebrew summary. Received August, 1950.]

The *Peridermium* stage of a rust was first observed on Aleppo pines (*Pinus halepensis*) in Palestine in a government nursery in the Hebron district during 1946. It developed under exceptionally cool, rainy weather in the spring and caused an epiphytotic. *Coleosporium senecionis* on *Senecio vernalis*, and *C. inulae* on *Inula viscosa* and *I. graveolens*, one of which may be the alternate state of the pine rust, have been present in the country for some years. The disease was found on pines in three localities in the Hebron district 630 to 675 m. above sea level and on the Jerusalem–Tel Aviv highway at 575 m. The western side of the trees exposed to winds from the Mediterranean Sea was severely attacked, but the eastern side facing the hot, dry Judean desert was only slightly affected.

Oort (A. J. P.). **Dennenmoorder en zwavelkopje als concurrenten.** [The Pine-destroyer and sulphur tuft as competitors.]—*Fungus, Wageningen*, 20, 1, pp. 2–4, 1 diag., 1950.

Rishbeth's article on the pine root disease caused by *Fomes annosus* in East Anglia [*R.A.M.*, 28, p. 654] prompted this discussion on the mode of infection and spread of that fungus and *Armillaria mellea*, and the antagonism of their competitors, e.g., *Hypholoma fasciculare, Peniophora gigantea*, and *Trichoderma viride.*

Edén (J.) & Rennerfelt (E.). **Fält-och rötkammarförsök avsedda at utröna skyddsverkan hos olika träimpregneringsmedel.** [Field and decay-chamber experiments designed to determine the protective action of different wood preservatives.]—*Medd. SkogsForsknInst., Stockh.*, 38, 4, pp. 1–35, 5 figs., 2 diags., 5 graphs, 1950. [English summary.]

Accelerated field and decay-chamber experiments to determine the relative efficiency as timber preservatives of tanalith U [*R.A.M.*, 29, p. 444], Boliden salt, Boliden fluorine salt, and coal tar creosote were instituted by the Swedish State Communications Department in 1943 [cf. ibid., 26, p. 369]. Scots pine (*Pinus sylvestris*) stakes, 50 by 5 by 2 cm., and poles, 2·23 and 0·37 m. long, were partially sunk in four plots in different places in the south of Sweden with about the same mean annual temperature but with varying precipitation. A mine shaft and a greenhouse were also used as testing sites.

The following are the principal results obtained up to September, 1947, after 52 months of exposure. Most of the untreated stakes in arable plots underwent rapid decay. More than half the untreated poles were also condemned, while the remainder were more or less severely damaged. In sand the stakes showed good resistance to decay, but the poles were badly rotted.

The damage to stakes treated with Boliden salt or creosote at the recommended rates was negligible, but tanalith U was less satisfactory, permitting the develop-

ment of moderate to severe decay. Creosote and Boliden salt also conferred effective protection on the poles, while the degree of rotting in those impregnated with tanalith U was assessed at slight to moderate. The samples treated with Boliden salt were found to contain about six times more arsenic oxide than those impregnated with tanalith U, a difference which may well account for the superior protective action of the former. The influence of fluorine is apparently less important, since Boliden fluorine salt, which has hitherto proved more effective than tanalith U, actually contains a smaller proportion of the element.

In the mine not even the untreated stakes were decayed; the impregnated poles were also sound, but the controls were severely attacked. Rotting progressed very rapidly in the greenhouse, especially in leaf mould (as compared with clay soil), the average periods of durability of the untreated stakes and of those impregnated with tanalith U, Boliden salt, and Boliden fluorine salt being 18, 31, 49, and 39 months, respectively.

Attempts to culture mycelium from the rotted wood were mostly unsuccessful owing to the abundance of contaminants, but *Paxillus panuoides* was observed forming fruit bodies in a number of samples, while *Coniophora puteana*, *Poria vaporaria*, and *Trametes serialis* were occasionally encountered.

Shore (B. C. G.). **Fungal decay of timber.**—*Parthenon*, 23, 9, pp. 166–170, 3 figs., 1949.

In this paper, read at a meeting of the London and Home Counties Branch of the Incorporated Association of Architects and Surveyors at Caxton Hall, Westminster, on 23rd March, 1949, the author presents in semi-popular form information on lignicolous fungi, with special reference to *Merulius lacrymans*. Following the use of a blow lamp, as recommended by the Forest Products Research Station for the sterilization of exposed surfaces after excision of diseased material, the application of a solution of barium naphthenate while the surface is still dry and warm is recommended.

Lockard (C. R.), Putnam (J. A.), & Carpenter (R. D.). **Log defects in southern hardwoods.**—*Agric. Handb. U.S. Dep. Agric.* 4, 37 pp., 51 figs., 1950.

This popular account in non-technical language without reference to specific organisms of log defects in southern hardwoods includes a summary of the factors affecting quality, the nature of log defects, log surface abnormalities, end abnormalities and imperfections, general appearances indicating the presence of specific defects, and the classification and evaluation of log abnormalities. In an Appendix a description is given of the symptoms of deterioration in dead timber and stored logs.

Creamer (G. B.). **Wood decay.**—*Pulp Pap.* (*Mag.*) *Can.*, 51, 4, pp. 86–90, 2 diags., 1 graph, 1950.

The loss to the pulp and paper and other wood-using industries through fungal decay, though impossible to assess exactly, is known to be immense. Relatively few Canadian mills, however, seem to have availed themselves of the little information obtainable from the relevant literature on methods of reducing this loss, which include peeling logs in the woods to secure rapid drying; sorting out infected material for immediate use after arrival at the mill; and stacking the remainder in clean, well-ventilated piles to be used in rotation, so that no wood is stored for much more than a year. The maximum damage appears to result from the proximity of rotting logs to sound ones with a 30 to 40 per cent. moisture content.

Acosta Solis (M.). **La importancia económica de la preservación de las maderas.** [The economic importance of wood preservation.]—*Publ. Dep. for. Ecuador* 9, 11 pp., 4 figs., 1950.

The author discusses the economic importance of timber preservation, the general

characteristics of [unspecified] wood rots and factors favouring their development, the materials most commonly used in timber preservation, and methods of applying creosote. The paper concludes with a note on the use of Wolman salts for prefabricated dwellings in the central provinces of Ecuador.

Verrall (A. F.) & Mook (P. V.). **Absorption of sapstain and mold control chemicals by wood.**—*Industr. Engng Chem.*, 42, 7, pp. 1350–1355, 4 graphs, 1950.

This is a fully tabulated survey and discussion of laboratory and field experiments at the Division of Forest Pathology, United States Department of Agriculture, Gulfport, Massachusetts, to determine the extent of absorption by green pine (mostly sapwood) lumber of four fungicides, namely, 0·24 per cent. lignasan, 0·96 per cent. dowicide G, 0·06 per cent. lignasan plus 2·4 per cent. borax, and 0·24 per cent. dowicide G plus 2·4 per cent. borax, commonly used for the control of stain, mould, and decay fungi (represented in this series by *Endoconidiophora virescens* [*R.A.M.*, 24, p. 37], *Ceratostomella ips* [ibid., 22, p. 413], *C. pilifera*, *Diplodia natalensis*, and *Penicillium* sp.) [cf. ibid., 29, p. 130].

Lignasan (6·25 per cent. ethyl mercuric phosphate plus inerts) suffered a severe reduction in efficiency after the dipping of sufficient wood to take up half the solution, whereas dowicide G (85 per cent. or more sodium chlorophenate plus sodium tetrachlorophenate and excess alkali) was only slightly weakened. The effects of absorption on mixtures of either compound or of both together with borax were intermediate. Commercial significance is accorded only to the reduction of the mercurial alone and in combination with borax.

Loss in strength of mercurial solutions can probably be reduced to a safe level by replenishment with higher concentrations than originally used, or by frequent renewal with those generally recommended. The latter would appear to be the more rational method of adjusting concentrations in most milling operations. The additions should be made before the solution level in the treating vat drops below 80 per cent. of the original volume.

Patel (M. K.), Abhyankar (S. G.), & Kulkarni (Y. S.). **Black rot of Cabbage.** —*Indian Phytopathology*, 2, 1, pp. 58–61, 1949. [Received June, 1950.]

Black rot of cabbage caused by *Xanthomonas campestris* [*R.A.M.*, 27, p. 96; 29, p. 393] has probably been present in India for a long time, but was first reported by G. B. Patwardhan in 1928 (*Bull. Dep. Agric. Bombay* 30). Since then it has spread throughout the country causing severe losses, especially in heavily manured fields near the big towns where the crop is grown every year. Recently black rot symptoms were observed on other cruciferous hosts, including cauliflower, radish, turnip, kohlrabi, mustard, *Lepidium sativum*, *Raphanus sativus* var. *caudatus* [rat-tailed radish], and *Brassica juncea*. Isolations yielded organisms similar in morphology, physiology, and pathogenicity, and it is assumed that *X. campestris* is the responsible agent.

Hot water treatment (30 minutes at 122° F.) is the best method of control, but disinfecting the seeds in 10 per cent. bleaching powder solution for four hours was fairly effective. Care should be taken, however, to raise seedlings in disease-free plots, and thin sowing is specially recommended.

Giddings (N. J.). **Some interrelationships of virus strains in Sugar Beet curly top.** —*Phytopathology*, 40, 4, pp. 377–388, 1950.

The results of tests at the Division of Sugar Plant Investigations, Bureau of Plant Industry, Riverside, California, with seven beet curly top virus strains [*R.A.M.*, 24, p. 83] yielded no evidence that any of them would immunize the host against infection by one of the others. The recovery of the less virulent component from plants inoculated with a virus mixture and showing symptoms of the stronger

strain provides a possible explanation of previously reported cases of attenuation [ibid., 9, p. 356]. The inoculation of susceptible sugar beets with a complex of more and less virulent strains may induce only mild symptoms, but in such cases the more virulent strain is sometimes recoverable. Reported cases of restoration of virulence may be explicable on this basis [ibid., 10, p. 424].

When beet leafhoppers [*Eutettix tenella*] were fed on two or three distinct virus strains and transferred daily to young, susceptible sugar beet plants, some of the latter developed dominant symptoms characteristic of one strain, while in others the features of a different one prevailed. The presence of two or all three strains was demonstrated by the recovery of the virus from some of the test plants and inoculating it into differential hosts. It was further clearly shown that plants inoculated with such virus mixtures might develop typical symptoms of the less virulent strain, which were retained for two or three weeks prior to the appearance of the severe manifestations of the more virulent.

Heiling (A.) & Steudel (W.). **Die Vergilbungskrankheit der Rübe.** [Beet yellows.] —*Flugbl. biol. ZentrAnst. Braunschw.* F3, 8 pp., 1 col. pl., 2 figs., 1950.

This is a useful summary of the available information (mostly well known) on the beet yellows virus in Germany [*R.A.M.*, 29, p. 395], where the principal centres of infection are the north Rhenish plain, Westphalia, the Main and southern Rhine valley, and certain districts in the south. The losses from the disease may be as much as 70 per cent. of the normal harvest, while the sugar content of severely infected beets is about 2 per cent. lower than that of healthy ones. Of the two aphid vectors, *Doralis* [*Aphis*] *fabae* and *Myzus persicae*, the former is the more active and regular; its winter hosts are *Euonymus europaeus* and *Viburnum opulus*.

Zaumeyer (W. J.). **Topcrop is top-notch ally in fight on Snap Bean mosaic.**—*Food Packer*, 31, 4, pp. 38, 40, 42, 45, 1 fig., 1950.

Full particulars, including the tabulated results of extensive field tests from 1945 to 1949, are given of the Topcrop snap bean [*Phaseolus vulgaris*] variety developed by the Bureau of Plant Industry, United States Department of Agriculture. It appears to be well adapted to processing, and of special interest is its resistance to bean mosaic virus [*R.A.M.*, 29, p. 284], a relatively new disease known as New York 15 mosaic, and pod mottle virus [ibid., 29, p. 1]. New York 15 mosaic is important in the principal bean seed-producing areas of the west, and is responsible, together with bean mosaic virus, for many instances of low yields and poor quality in some of the standard varieties, such as Tendergreen, Landreth Stringless Green Pod, Full Measure, and Stringless Black Valentine.

Adair (C. R.), McClelland (C. K.), & Cralley (E. M.). **Soybean research in Arkansas, 1936–48. Varietal tests for seed and hay and studies in disease control.**—*Bull. Ark. agric. Exp. Sta.* 490, 62 pp., 1950.

Seed treatment of soy-beans in Arkansas from 1934 to 1947 with arasan, arasan SF, spergon, and new improved ceresan [cf. *R.A.M.*, 29, p. 397] increased stands at early, medium, and late planting dates but gave no significant increases in yield. There was no increase in yield when treated seed was sown at the rate of 50 lb. per acre, and with high-quality seed a lighter sowing might be adopted if the seed is treated. Seed treatment is recommended when poor-quality seed with low germinability is planted. Seed treatment with spergon or arasan was found to be compatible with seed inoculation [cf. ibid., 29, p. 100] for land previously planted with soy-beans. Seed treatment is not recommended when soy-beans are planted on land for the first time.

The principal control measures for leaf diseases, viz., bacterial pustule (*Xanthomonas phaseoli* var. *sojense*), bacterial blight (*Pseudomonas glycinea*) [*P. glycines*],

wildfire (*P. tabacum*), frog-eye (*Cercospora sojina*), and brown spot (*Septoria glycines*) [ibid., 28, p. 154], are crop rotation and planting resistant varieties. Ogden, Doctchsoy 2, Palmetto, CNS, Cherokee, and Louisiana Green are the most resistant to bacterial pustule, bacterial blight, and wildfire. Hale 12 is resistant to the first two and probably to wildfire.

Owen (J. H.), Walker (J. C.), & Stahmann (M. A.). **Pungency, color, and moisture supply in relation to disease resistance in the Onion.**—*Phytopathology*, 40, 3, pp. 292–297, 1950.

During 1948, studies were made at the University of Wisconsin in co-operation with the United States Department of Agriculture to determine the influence of pungency and colour of the bulb scales and moisture supply on the development of smudge (*Colletotrichum circinans*), black mould (*Aspergillus niger*), and neck rot (*Botrytis allii*) in onions [cf. *R.A.M.*, 28, p. 46]. Six varieties, both mild and pungent, of white, red, and yellow colours were grown in field plots naturally infested with smudge and black mould and artificially inoculated with neck rot. The incidence of each disease was studied in a normal environment and under excessively moist conditions. The onions were harvested in late August, stored for two to three months, and the disease indices determined.

An abundance of moisture greatly increased the occurrence of neck rot and smudge, and both diseases were more severe on mild than on pungent varieties in each colour group. With neck rot the differences between the coloured and white varieties in the mild class were not significant, but in the pungent class the index was significantly higher in the white variety than in either coloured variety. Wind-borne spores of *B. allii* incited severe neck rot infection under wet conditions. White varieties had significantly higher smudge indices than coloured varieties.

Black mould was more severe under dry than under moist conditions. Under dry conditions there was little difference in its development on white and on coloured varieties, but under moist conditions coloured varieties showed more black mould than the white varieties. Pungency was of no importance in determining the incidence of this disease.

Watson (R. D.) & KenKnight (G.). **The effect of yellow dwarf on yield of Onion seed.**—*Phytopathology*, 40, 4, pp. 392–393, 1950.

Reductions in the Ebenezer onion seed crop caused by yellow dwarf virus [*R.A.M.*, 23, pp. 93, 469, 470] were investigated at the Idaho Agricultural Experiment Station. Two rows were selected at random in each of three parts of a field, of which the central one had produced a seed crop the year before. In each row seed heads were collected from the first ten healthy and the first ten diseased plants.

Individual infected plants yielded about one-third as much clean dry seed as healthy ones, the mean weights per plant being 0·922 and 2·625 gm., respectively. The part of the field carrying the second crop yielded less seed than the areas on either side, and the reductions from yellow dwarf were heavier. The disease impaired the vigour and growth of the plants, as indicated by the length of the fruit stalk. On infected plants only 6·8 per cent. of the stalks were over 36 in. long, as compared with 86·2 per cent. on healthy ones. As a whole, the significant correlation of these data was 0·81 between high yield and elongation of the stalk.

Bedi (K. S.). **Infectivity and longevity of dried cultures of Ascochyta rabiei (Pass.) Lab., the causal fungus of Gram blight.**—*Indian Phytopathology*, 2, 1, pp. 6–10, 1949. [Received June, 1950.]

In experiments carried out in 1938 at the Agricultural Farm, Campbellpur, Punjab, the author found dried cultures of *Ascochyta rabiei* [*R.A.M.*, 18, p. 86] to be satisfactory for artificial field inoculation of gram (*Cicer arietinum*) plants. The

agar culture mats, ranging in age from 1½ to 14 months, dried for several days at room temperature, were suspended 6 in. above plants in plots screened from secondary infection by a plant barrier, and within a week after a rain shower all the plants became severely infected, while those in a plot without inoculum remained healthy. Dried culture mats retained their viability for 33 months, while cultures in test tubes or plates in the laboratory during the summer died within ten days. Tests with dried cultures of *Rhizoctonia bataticola* [*Macrophomina phaseoli*], *Colletotrichum falcatum* [*Physalospora tucumanensis*], *C. graminicola*, *C. gloeosporioides*, *Alternaria solani*, and *Ascochyta pisi* showed that all were viable after being dry for one year.

Holmes (F. O.). **Problems in research on viruses and viral diseases.**—*Indian Phytopathology*, 2, 1, pp. 39–45, 1949. [Received June, 1950.]

The author reviews the progress made in plant virus research with relevant references to the literature (36 titles), and discusses some important problems still awaiting solution. These include the propagation of viruses in sterile culture media, relationships between the major groups of viruses (affecting plants, men and animals, and bacteria), the nature of viruses, natural immunity, host ranges, new virus and vector types, mechanical transmission of biologically transmitted viruses, auxiliary methods for the preservation of the viability of labile viruses, chemical therapy, and genetic resistance.

Thirtieth Report of the National Institute of Agricultural Botany, Cambridge, 1948–49.—39 pp., [? 1950].

Varieties recommended for further trial by the Cereal Trials Advisory Committee in Great Britain include the winter wheats Staring from Holland (Vilmorin 23 × Juliana), which remained free from loose smut [*Ustilago tritici*: *R.A.M.*, 29, p. 295], and Hybrid 46 (Hybrid 40 (Beroist 40) × other hybrids) susceptible to loose smut.

The percentage of celery seed affected by leaf spot (*Septoria apii-graveolentis*) [ibid., 28, p. 48] was lower than in the 1947–48 season. Samples with more than 21 per cent. infected seed amounted to 24·1 and 14·6 per cent. for the two seasons, respectively. Samples with no sign of infection had risen from 10·5 per cent. to 32·8. Thirteen per cent. of oat samples were free from *Helminthosporium* [*Pyrenophora*] *avenae* [ibid., 27, p. 127].

Low germination of perennial rye grass seed [*Lolium perenne*] was associated with blind seed disease (*Phialea temulenta*) [ibid., 29, p. 156]. S. 24 and Kent Perennial samples included a higher proportion of samples germinating below 60 per cent. than any others. Wheat bunt (*Tilletia caries*) infection was found in 1·4 per cent. of samples by eye-inspection, *Claviceps purpurea* in 0·6 per cent. of the wheat and 20·8 per cent. of rye, and *Ustilago hordei* in 0·3 per cent. of the barley.

Foister (C. E.). **Report of the Annual Conference of the Cryptogamic Section, 1948.**—*Trans. bot. Soc. Edinb.*, 35, 2, pp. 203–206, 1949.

A list is given of cryptogams collected by the Cryptogamic Section of the Botanical Society of Edinburgh during forays made in October, 1948, in the Thornhill district of Dumfriesshire [cf. *R.A.M.*, 28, p. 442]. The records include *Mastigosporium rubricosum* [ibid., 19, p. 414] on *Dactylis glomerata*.

Oswald (J. W.). **Etiology of cereal root rots in California.**—*Hilgardia*, 19, 15, pp. 447–462, 8 figs., 1950.

Root rots of cereals are widespread in California [cf. *R.A.M.*, 27, p. 179; 28, p. 447], constituting a major problem with wheat and barley in the Montezuma Hills

area of Solano county, the Sacramento–San Joaquin Delta, the Montpelier region of Stanislaus county, and in certain localities in Fresno, Tulare, and Kings counties. The pathogens most commonly isolated from affected plants over a six-year period were, in order of apparent economic importance, *Helminthosporium sativum*, *Gibberella rosea* f. *cerealis* [*G. zeae*] (also occasionally from oats and maize), *Ophiobolus graminis*, and *Calonectria graminicola* [*C. nivalis*]. These were encountered in 134 fields in 20 counties. The two first-named induced similar symptoms on wheat and barley, both in the seedling stage and in the mature plant. They attacked the subcrown internode and crown and basal culm tissues, causing a brown discoloration and necrosis but with little damage to the roots. *H. sativum* appeared to be more important as a cause of seedling blight and *G. zeae* of root rot in the later stages of plant growth. Perithecia of the latter fungus were only once found in the field and their absence accounts for the non-development of the scab and head-blight phases. Non-perithecium-producing clones, such as those formerly designated as *F. culmorum* var. *leteius*, were important only in soils of high organic content, occasionally causing root rot of oats.

O. graminis was severe in certain areas on both wheat and barley. It has been located in 17 fields representing seven counties. Perithecia were not found under field conditions but developed abundantly on plants inoculated in the greenhouse. *Pythium graminicola*, *Sclerotium rolfsii*, and *Rhizoctonia* [*Corticium*] *solani* were observed occasionally to cause root rot damage in barley. *P. graminicola* may cause a reduction in stand and severe weakening of the surviving plants under conditions of extremely high soil moisture. *S. rolfsii* may cause considerable root rot damage in late-planted barley, in conjunction with high temperature and unseasonal rains or irrigation.

McKinney (H. H.). **Infectious and non-infectious pigment disorders in the small grains, with particular reference to the southeastern area.**—*Plant Dis. Reptr*, 34, 5, pp. 151–154, 1950. [Multilithed.]

From his studies on pigment disorders in small grains (which tend to confuse the virus problem) in the United States, the author concludes that apart from the pigment disorders induced by parasites and possibly by viruses not yet discovered, cold injury to the leaves and nitrogen deficiency account for most of the trouble. Often low temperatures affect the plastids in certain varieties, and the leaf tissue gradually turns pale green and may die, beginning at the tip of the leaf. Most of the anthocyanin type of pigmentation, especially common in certain oat varieties, appears to follow abnormally low temperatures, or excessive soil moisture conditions, or both.

Germ (H.). **Über einige grundsätzliche Fragen der Gesundheitsprüfung des Saatgutes. (Mit Berücksichtigung der Samenkontrolle in Österreich).** [On some fundamental questions connected with testing the health of seed. (With reference to seed control in Austria).]—*Bodenkultur, Wien*, 4, 1, pp. 28–34, 1950.

The standards for seed health set by the Federal Institute of Agriculture and Seed Testing in Vienna in 1949 are now legally recognized as the basis of testing, which is concerned, on the one hand, with the quality of the seed, and on the other, with its infection by pathogens. The current methods of testing accord increased importance to the determination of germinability.

In the determination of fungal infections, a line must be clearly drawn between deep-seated and superficial diseases; with the latter the advisability or otherwise of treatment must be decided for the particular type of seed under investigation. Strict attention should also be paid to the presence of saprophytes, an index of constitutional weakness at this early stage. A very complex problem, requiring

special study, is the diagnosis of wheat and barley loose smuts [*Ustilago tritici* and *U. nuda*] on the seed. Difficulties are presented, moreover, by the quantitative appraisal of an infection. For instance, the agents of pea anthracnose [*Ascochyta pisi*, *A. pinodella*, and *Mycosphaerella pinodes*] may be more or less confined to the exterior of the seed or penetrate it for varying distances; they may be situated on the cotyledons far from the germinal layer or directly adhering to the latter. In such cases it is often scarcely practicable to assess the state of health as distinct from the other components of the value-complex on which a final judgment must be based, e.g., varietal purity, germinability, and germinative energy.

GOKHALE (V. P.). **A new biotype of race 15 of Puccinia graminis tritici.**—*Curr. Sci.*, 19, 7, pp. 214–215, 1950.

The Charter wheat variety, previously resistant to the physiologic races of *Puccinia graminis tritici* known to occur in India, bore uredosori of the susceptible type in field plots at the Wheat Rust Station, Mahableswar, during the severe stem rust outbreak of 1946–7 [*R.A.M.*, 26, p. 293]. Uredospore material, multiplied on the seedlings of N.P. 4, was used for the inoculation of Charter seedlings raised in a rust-free room of the glasshouse. The resultant reaction was of a susceptible type, whereas the same variety proved resistant when inoculated with a mixture of the known races. The reactions of the 12 standard differential varieties to infection with monospore cultures of the new isolate agreed closely with those induced by race 15, originally supplied by Mehta [ibid., 20, p. 292]. However, since Charter is resistant to that race but susceptible to the new isolate, the latter is presumed to be a distinct biotype which it is proposed to designate 15C [cf. ibid., 22, p. 348; 25, p. 62].

Race 15C is more virulent than 15, being highly pathogenic to C. 14112 and Gaza Q and moderately so to 60B–12B–16L, Bobin × (Bobin × Gaza), and Gabo, all of which are immune from or resistant to all other races of *P. g. tritici* known to occur in India.

The new biotype did not reappear in the field for three years after its discovery, and then only to a slight extent. Should it recur in significant proportions, a reorientation of the present programme of hybridization for resistance to stem rust, using the above-mentioned varieties (including Charter), will become necessary. Varieties of the type of Kenya E. 144, C. 9906, 291, and J.I.I., however, are resistant to the new race as well as to the old ones.

GATTANI (M. L.). **Induced lysis in the germination of the uredospores of the Wheat rusts.**—*Curr. Sci.*, 19, 7, pp. 217–218, 2 figs., 1950.

A tendency to lysis in the promycelia of *Ustilago zeae* and *Sphacelotheca sorghi*, governed in both cases by one or more genetic factors, has been reported by Chilton [*R.A.M.*, 23, p. 13] and Laskaris [ibid., 20, p. 299], respectively. In the course of tests at the Indian Agricultural Research Institute, New Delhi, of a home-made hydrophobic colloidal sulphur spray for wheat rust (*Puccinia* spp.) control, germination of the uredospores of *P. graminis* and *P. triticina* was found to be inhibited on 1 per cent. water agar containing 20 p.p.m. of the fungicide. On the same medium with 10 p.p.m. colloidal sulphur the spores of the two rusts produced germ-tubes 10 to 15 μ long after 18 hours at 18° C. Further growth was arrested by lysis, which in some cases occurred at the formation of the first rudiments of the germ-tubes. The process was even observed in water containing only 2 p.p.m. of the fungicide, although the average lengths reached by the germ-tubes of *P. graminis* and *P. triticina* at this concentration were 35 μ and 75 μ, respectively. At 1 p.p.m. there was no appreciable lysis, but the germ-tubes were smaller than those in the control plates. In the case of yellow rust [*P. glumarum*], spore germination

was inhibited on agar containing 2 p.p.m. of the fungicide, and lysis occurred at a concentration of 1 p.p.m. Germination in the control plates was uniformly normal, showing that lysis of the germ-tubes is attributable to the activity of the colloidal sulphur. The term 'germinolytic' is proposed for the properties of a fungicide inducing lysis of the germ-tubes.

The stock solution of colloidal sulphur was prepared by slaking 1 lb. sulphur and ½ gal. water, boiling for about half-an-hour until the specific gravity of the mixture reached 1·28, adding 650 gm. molasses, and stirring the whole while still hot until the molasses dissolved.

Milbrath (D. G.). **Flag smut of Wheat.**—*Bull. Dep. Agric. Calif.*, 39, 1, p. 4, 1 pl., 1950.

Wheat flag smut (*Urocystis tritici*) [*R.A.M.*, 26, p. 173; 28, pp. 13, 167, 387; 29, p. 17 *et passim*] has been found in the United States in Illinois, Missouri, Kansas, and Washington [C.M.I. map no. 80], but has been brought under control, if not eliminated, by the use of resistant varieties. The disease is of major importance in winter wheat areas with a mild climate, where wheat is extensively and continuously cultivated.

Schafer (L. A.) & Hansing (E. D.). **Effect of hot-water treatment on emergence of spring Barley and control of brown loose smut.**—*Phytopathology*, 40, 5, pp. 518–521, 1950.

The results of a large-scale, uniform trial conducted at the Kansas Agricultural Experiment Station in 1948 to determine the effect of the hot-water treatment for the control of loose smut (*Ustilago nuda*) [*R.A.M.*, 20, p. 10 *et passim*] on five spring barley varieties, namely, Atlas 46, Beecher, Feebar, Flynn I, and Spartan from 12 stations in the central and western States are described and tabulated. One portion of the sample of each variety was pre-soaked in tap water for five hours, another for three, and a third was left untreated. All the pre-soaked samples were then placed in a bath at 120° F. for two minutes, transferred to 126° for 13 minutes, immersed in tap water for two minutes, and finally spread out to dry. Four replications of 150 seeds for each treatment of the five varieties from all stations were planted in randomized 8-ft. rows in the nursery.

Taking the 12 stations as a whole, the five-hour pre-soak caused the greatest damage to Beecher, reducing its emergence by 33 per cent. as compared with the untreated sample. The corresponding reductions in Atlas, Spartan, Flynn, and Feebar were 28, 20, 9, and 7 per cent., respectively. The percentage of emergence following treatment varied greatly among the seed lots with the place of origin. The average percentage reduction in emergence for the five varieties following the five-hour pre-soak ranged from 50 per cent. for Lind, Washington, to only 7 per cent. for Highmore, South Dakota. Atlas seed from the former station sustained the heaviest damage, with a reduction in emergence from 86 to 11 per cent. No correlation was apparent between the degree of injury and the weight or moisture content of the seed at the time of treatment.

The incidence of loose smut in the samples from Hays, Kansas, and Lincoln, Nebraska, averaged 12·8 and 11·4 per cent., respectively; in the lots from Colby, Kansas; North Platte, Nebraska; Highmore, South Dakota; Dickinson, North Dakota; Akron, Colorado; and Loraine, Wyoming, 2·7 to 6·9 per cent.; and in those from American Falls, Idaho; Moccasin, Montana; Moro, Oregon; and Lind, Washington, 0·2 per cent. or less. Beecher was the most susceptible, the samples from Hays, Kansas, and Lincoln, Nebraska, showing 28 and 32 per cent. smutted heads, respectively.

The three-hour pre-soak, followed by the hot-water treatment, reduced the

incidence of infection below that of the control samples by 92, 87, 74, 68, and 67 per cent., respectively, in Beecher, Atlas, Flynn, Feebar, and Spartan. The smut was eliminated from the samples pre-soaked for five hours except for Flynn from Lincoln, Nebraska, and Dickinson, North Dakota, in which infection was reduced from 10·7 to 0·4 and 1·4 to 0·2 per cent., respectively.

The practical control of *U. nuda* in susceptible barley varieties is complicated by the variations arising from different weather conditions prior to harvesting and seed injury during threshing [ibid., 3, p. 712]. The ideal method of combating the disease would be by the breeding and distribution of resistant varieties.

Vasudeva (R. S.) & Seshadri Iyengar (M. R.). **Control of loose smut of Barley.** —*Curr. Sci.*, 19, 7, pp. 218–219, 1950.

Loose smut (*Ustilago nuda*) causes an annual reduction in the Indian barley crop of 1 per cent. or 19,580 tons (at a conservative overall estimate), representing a financial loss of over 38 lakhs [1 lakh = 100,000] of rupees. At the Indian Agricultural Research Institute, New Delhi, the disease was successfully combated by Luthra and Sattar's solar heat treatment for the control of *U. tritici* on wheat [*R.A.M.*, 14, p. 22]. Seed was soaked in cold water on 23rd June, 1949, from 6 a.m. to 10 a.m. and exposed to the sun on a brick floor from 10 a.m. to 5 p.m. The temperature of the floor during this period ranged for the most part from 114·8° to 129·2° F. but touched 132·8° for a short time. The air temperature fluctuated between 105° and 111·2°. The seed was then stored until the following 17th November, when it was sown in two experimental plots, which remained entirely free from loose smut as compared with an incidence of 6 and 6·8 per cent. in the adjacent ones with untreated seed.

Bohmont (D. W.). **Susceptibility of some Barley varieties to bacterial blight.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 1, p. 42, 1949.

In a greenhouse at the University of Wyoming 14 barley varieties and selections were planted in 6-in. pots in two replications and inoculated at the early headed stage with a suspension of *Xanthomonas translucens* [*R.A.M.*, 25, p. 389] applied as a spray. The symptoms developed four to eight days later, the pathogen being re-isolated from the diseased plants. Trebi, WS 471, Gem, Lico, and Velvon proved to be resistant, while Frontier, C.I.7152, 7248, 7247, 7244, and 7008, Beecher, Club Mariout, and Flynn 37 were susceptible.

Pendleton (J. W.), Dungan (G. H.), Bigger (J. H.), Lang (A. L.), Koehler (B.), Jugenheimer (R. W.), & McKibben (G. E.). **Illinois tests of Corn hybrids in widest use in 1948.**—*Bull. Ill. agric. Exp. Sta.* 531, pp. 59–91, 1 fig., 1 map, 1949.

In this report [cf. *R.A.M.*, 28, p. 453; and next abstract] the disease damage to test fields of maize at seven localities in Illinois during 1948 is described. In the autumn maize stalk rots were prevalent, 39·7 per cent. of the stalks being infected with *Diplodia zeae*, 17·6 per cent. with *Gibberella zeae* (which caused considerable damage), and smaller percentages with *Fusarium moniliforme* [*G. fujikuroi*], *Nigrospora oryzae*, and *Sclerotium bataticola* [*Macrophomina phaseoli*: ibid., 28, p. 453], but the losses in 57 counties were estimated at only 4·3 per cent.

Damage from ear rots was low, except in some fields after frost in north-central and northern parts of the State. In a field in Boone county all the ears were reported rotted, mainly due to a combined attack by a species of *Hormodendrum* and *N. oryzae* [ibid., 26, p. 392]. Species of *Hormodendrum* were much more prevalent than of recent years, inflicting considerable losses in commercial and seed-producing fields.

Pendleton (J. W.), Dungan (G. H.), Bigger (J. H.), Koehler (B.), Lang (A. L.), Jugenheimer (R. W.), & McKibben (G. E.). **Illinois tests of Corn hybrids in wide use in 1949.**—*Bull. Ill. agric. Exp. Sta.* 536, pp. 467–504, 2 figs., 1 graph, 1 map, 1950.

In the report on disease damage (pp. 477–480) in the 1949 maize hybrid tests [see preceding abstract] at eight centres in Illinois it is stated that, as was forecast, Stewart's disease [*Xanthomonas stewarti*: *R.A.M.*, 29, p. 462] was widespread except in the northern quarter of the State, the worst damage occurring in south-central areas [see next abstract]. In many fields all leaves had been killed by early September. *Helminthosporium* leaf blight (*H. turcicum*) was also more prevalent than usual, completely killing the leaves in southern districts by the end of August.

The most damaging agents of stalk rots, *Diplodia zeae* and *Gibberella zeae*, followed attacks by *X. stewarti* and *H. turcicum*. The combined losses from leaf blights and stalk rots in the southern part of the State were estimated at 20 per cent., and at 13 per cent. in the northern part. For the State as a whole the assessed damage averaged 16·5 per cent.

Of 4,300 plants examined in 37 counties, 5·3 per cent. were infected with smut [*Ustilago maydis*], the loss for the State being estimated at 1·6 per cent. The incidence of ear rots (associated with various fungi) was slightly higher than in 1948, *Fusarium moniliforme* [*G. fujikuroi*] being the most prevalent fungus.

Boewe (G. H.). **Stewart's disease prospect for 1950.**—*Plant Dis. Reptr*, 34, 5, p. 155, 1 map, 1950. [Multilithed.]

A forecast, based on the close relationship that appears to exist between the amount of bacterial wilt [*Xanthomonas stewarti*: *R.A.M.*, 28, p. 453] of maize that develops during the summer and the temperature of the preceding winter, suggests that in 1950 the disease will probably occur much farther north in Illinois and be much more destructive than in the summer of 1949 [see preceding abstract]. Early season wilt is expected to be destructive in the south, and light to severe in the central areas. The late-season leaf blight phase is forecast as severe in the south, moderate to severe in the central parts, light to moderate in the north, and absent or slight in the extreme north.

Haskins (R. H.). **Biochemistry of the Ustilaginales. I. Preliminary cultural studies of Ustilago zeae.**—*Canad. J. Res.*, Sect. C, 28, 2, pp. 213–223, 1 pl., 3 graphs, 1950.

In the course of a programme of screening a wide range of fungi for ability to 'ferment' glucose and various agricultural wastes and surpluses in submerged culture at the National Research Council Prairie Regional Laboratory, Saskatoon, Saskatchewan, shake cultures of *Ustilago zeae* [*U. maydis*] utilized over 87 per cent. of the total carbohydrate in a nutrient solution containing 5 per cent. glucose in three days. It produced a complex substance, appearing as long needle-like optically active crystals in the culture mixture, fats and sterols, and a range of new antibiotic substances designated as ustizeain A, B, etc. [cf. *R.A.M.*, 29, p. 322]. Decreased aeration reduced the rate of fermentation. Potassium, magnesium, sulphate, and phosphate were essential to the good growth of the organism.

The antibiotics produced were stable and one was effective *in vitro* against Gram-positive bacteria and one Gram-negative species. The other was effective against certain *Penicillium* spp., *Aspergillus* spp., *Verticillium* spp., and many other Fungi Imperfecti.

Bain (D. C.). **Fungi recovered from seed of Sorghum vulgare Pers.**—*Phytopathology*, 40, 5, pp. 521–522, 1950.

The following data obtained in studies on seed-borne diseases of sorghum at the

Truck Crops Branch Experiment Station, Crystal Springs, Mississippi, from 1940 to 1942 are of interest in connexion with the recent detection of *Gloeocercospora sorghi* in Venezuela [*R.A.M.*, 29, p. 97], presumably introduced on seed from the United States.

Four separate lots of seed were soaked for two minutes in alcoholic mercuric chloride, rinsed in calcium hypochlorite, plated on bean agar, and incubated at 25° C. for eight to ten days. One lot was from Louisiana plants known to be heavily infected by *G. sorghi*; the pathological history of the remaining lots, from Texas, Tennessee, and Mississippi crops, was unknown. The Louisiana seed, collected in the autumn of 1940, was divided into three portions, of which one was plated immediately, another in the spring of 1941, and the third in that of 1942. The 574 seeds of the first portion yielded 15 colonies of *G. sorghi* with 2·61 per cent. infected seeds, the corresponding figures for the second batch of 300 seeds being 28 and 9·33 per cent., and for the third of 100, 4 and 4 per cent., respectively. Other species recovered from the Louisiana seed were *Acrothecium*, *Phoma*, *Fusarium*, and *Chaetomium*, which were abundant in the first two platings, indicating that the organisms were capable of persisting in a viable condition within the seed for at least 18 months.

The Tennessee and Mississippi lots yielded species of *Acrothecium*, *Helminthosporium*, *Penicillium*, and *Hormodendrum*. More varied was the fungus flora of the Texas seeds, cultures of which gave rise in 1943 to the following: *Acrothecium*, *Alternaria*, *Aspergillus*, *Chaetomella*, *Chaetomium*, *Helminthosporium*, *Cladosporium*, *Sordaria*, *Fusarium*, and *Rhizopus*.

Brichet (J.). **La grande maladie des vieux Citronniers, la décorticose.** [The serious disease of old Lemon trees, decorticosis.]—*Fruits & Primeurs*, 20, 213, pp. 127–129, 1950.

After growing normally for 15 or 20 years the vitality of lemon trees on the North African coast suddenly diminishes, growth is arrested, and the tips of the young branches or even the entire branches wither, so that the tree becomes a mass of dead twigs. The bark on the trunks develops longitudinal cracks and there is gum exudation characteristic of shell bark [*R.A.M.*, 29, p. 258], with which the African disease is identified. The cracks are initiated on or near the grafting node, on which they are most numerous. The new bark becomes similarly affected.

The most susceptible trees are of Mediterranean origin, especially the 'four seasons' lemon tree, which is the most widely grown, and Eureka. Varieties of American origin such as Lisbon and Villafranca appear to be less susceptible. The disease appears to be limited to ungrafted lemon trees or to those on Seville orange stocks.

The author describes the physico-chemical methods of controlling the disease prescribed by H. S. Fawcett. Genetic methods and the rigorous selection of scions appear to be particularly efficient preventive measures. It has been demonstrated that certain lines of trees from grafts with selected scions remain free from shell bark until a very advanced age, even when grown among strongly contaminated trees.

A system of double grafting was devised whereby a section of a species immune from shell bark, such as Thomson's or Washington's Navel orange or pomelo (*Citrus paradisi*), is grafted between the Seville orange stock and the lemon scion. This method also prevents premature ageing and ensures a prolonged economic life.

Martin (J. P.). **Effects of fumigation and other soil treatments in the greenhouse on the fungus population of an old Citrus soil.**—*Soil Sci.*, 69, 2, pp. 107–122, 1950.

In further experiments at Riverside, California, the treatment of old citrus and non-citrus soils by steam under pressure, leaching [see next abstract], or with

various fumigants, fungicides, or insecticides, followed by cropping with sour or sweet oranges or tomatoes, markedly affected the nature of the fungal population of the soil [*R.A.M.*, 28, p. 62]. After the initial quasi-total or complete destruction of the populations, the fungi re-established themselves, one or more of 10 species commonly, and one or more of 24 occasionally becoming dominant. The former group included *Aspergillus versicolor*, *Fusarium oxysporum*, *F. solani*, *Penicillium* spp. (among them *P. nigricans* and *P. restrictum*), and *Trichoderma lignorum* [*T. viride*], and the latter *A. candidus*, *A. niger*, *A. ochraceus*, *A. sydowi*, *Cylindrocarpon radicicola*, *Gliocladium penicillioides*, *Monotospora brevis*, *Oospora variabilis*, *P. humicola*, *Rhizopus nigricans* [*R. stolonifer*], *Thielaviopsis basicola*, and *Trichothecium roseum*. Some of the species were present in relatively high concentration in the original soil, others were more sparsely represented, and several were rare or absent. In some pots the species first becoming established after chemical treatment remained the dominant types for the duration of the cropping trial (nine months), while in others a succession of forms developed.

For the destruction of soil fungi and altering the character of the subsequent microbial population, steam under pressure (15 lb. for seven hours), fumigation with chloropicrin (4 ml. per pot) or DD (8 ml.) [ibid., 29, p. 243], and leaching with 2 per cent. sulphuric acid or 2 per cent. potassium hydroxide were more effective than fumigation with carbon disulphide (12 ml.), soil saturation with dithane (1 in 2,400), treatment with hexachlorocyclohexane (50 p.p.m.), and other substances.

All the treatments except dithane, hexachlorocyclohexane, and steam appreciably increased the growth of orange seedlings in old citrus soils but did not materially affect development in most of the others. In general, there was no definite correlation between the fungal population of the soil and plant growth, except where *Fusarium* spp. predominated, when a tendency to reduction was observed. Partial sterilization usually caused a decrease in root decay. On the basis of the experimental data it is concluded that a detrimental soil population is partly responsible for the poor growth of citrus seedlings in old citrus soils, and that the change in microbial balance resultant on partial sterilization may be one of the factors contributing to an improvement in the condition of the plants. There are, however, believed to be other reasons besides soil fungi for unthriftiness in old citrus soils.

MARTIN (J. P.). **Effect of various leaching treatments on growth of Orange seedlings in old Citrus soils.**—*Soil Sci.*, 69, 6, pp. 433–442, 2 figs., 1950.

On the assumption that a toxic substance is concerned to some extent in the unthrifty growth of citrus trees in Californian soils previously cropped with the same plant for lengthy periods [see preceding abstract], investigations were conducted at the Citrus Experiment Station, Riverside, to determine the possibility of overcoming this retarding effect by soil leaching with various materials. It was found that the growth-inhibiting factors in old citrus soils were entirely counteracted by leaching with 2 per cent. sulphuric acid or 4 per cent. potassium hydroxide, followed by saturation of the soil colloids with calcium alone or combined with magnesium, potassium, and hydroxide. Similar results were obtained in sand cultures.

CELINO (M. S.). **Progress report on experimental transmission of cadang-cadang disease of Coconut.**—*Philipp. J. Agric.*, 13, 2–4, pp. 109–111, 1 pl., 1947.

Because of the destructiveness and rapid spread of cadang-cadang disease of coco-nut reported from San Miguel Estate, Albay, and Camarines Sur in the Philippines [*R.A.M.*, 17, p. 108], mechanical transmission experiments were carried out at San Pablo, Laguna. The disease was transmitted through needle pricks, the symptoms appearing in 12 seedlings after 30 to 130 days. The results indicated that the disease is of the highly infectious chlorosis type. Several species of sucking insects were found on coco-nut palms in the area.

MARTYN (E. B.). **Further observations on the 'unknown disease' of Coconuts.**—*Trop. Agriculture, Trin.*, 26, 7–12, pp. 110–112, 1949.

The unknown disease of coco-nuts [*R.A.M.*, 29, p. 459] has progressed steadily westward along the coast of Jamaica during the past five years to Orange Bay, and along the north-west coast of Hanover, although here the palms are not uniformly numerous, but plantations or shore-side groves alternate with areas in which only scattered palms appear. Usually in this area scattered cases are seen at the eastern end of a plantation, followed by an increase of the disease to epidemic proportions, the intensification then proceeding steadily from east to west. The process then repeats itself in the adjoining plantation. The manner of spread indicates that the disease is of an infectious nature.

Distribution and spread are not always as straightforward as this, however. In Hanover it spreads rapidly on the flat lands bordering the coast and in the mouths of the valleys, but in some parts of the hilly limestone land behind the coast it makes very little headway. Also it is far less serious on limestone soils such as in north-east Trelawny.

The unilateral appearance of the symptoms on mature palms frequently observed by Leach in the early stages of the disease [ibid., 25, p. 447] is compatible with the entry of the disease at one point of the root system only. Furthermore the initial symptoms involving nut-fall in mature palms, coupled with a breakdown of the growing point and of young growing tissues in the inflorescence suggest that some toxic substance is being carried to these tissues. The manner of death of the tissue at the base of the heart in young, non-bearing palms also suggests toxic action and subsequent attack by saprophytic bacteria rather than initial entry of an organism here. The primary symptoms, irregular spread of the disease, and its confinement for many years to certain areas only are incompatible with the action of an insect vector.

The death of the heart before the outer leaves and the fact that no parasitic organism can be discovered in the roots in the early stages of the disease render it unlikely that an organism is responsible for their death. The presence of an abnormal amount of starch in the cortex of young roots, and sometimes the formation of tyloses in the vessels, and some initial entry of fungi into the cortex, are more suggestive of the absorption, presumably through the roots, of a substance of a virus or toxic nature.

COOKE (F. C.). **The tapering disease of Coconuts.**—*Ceylon Coconut Quart.*, 1, 1, pp. 17–21, 1950.

The so-called 'tapering disease', first recorded in Jamaica in 1903, has appeared in the Seeduwa area of the Western Province of Ceylon, where four stages in its progress may be differentiated. In the first place, the crown of a healthy, productive palm becomes asymmetrical and uneven; the green of the upper leaves is too light, while the lower ones assume a yellowish tint, with a yellowing or rusting of the tips of the leaflets; and just below the crown a black band develops on the sturdy, grey trunk with its evenly spaced leaf scars.

The second phase is marked by a diminution of the crown owing to the curtailment in length of the leaves now in course of production to three-quarters of the normal. The middle leaves are yellowish-green and two or three of the lower ones yellowish-red or necrotic (rusty brown), while some may be broken. The trunk begins to taper towards the crown, just below which there is a marked reduction in diameter. At this point, too, the leaf scars are only about 1 in. apart, instead of the normal 2 in., and the black band of discoloration is broader. There are less than ten small, elongated nuts, the ripe ones usually containing no water.

With the advent of the third stage the palm approaches its end. The sparse, uneven crown surmounting the pencil-pointed trunk has decreased to half its

original size. The top fronds are yellowish-green, the middle leaves yellow with necrotic, brown tips, while the lower ones, brown, shrivelled, and ragged, still hang on, and the spathes may bear one or two useless nuts.

Only a few scraggy leaves remain in the fourth and final stage, when the crown collapses, sometimes remaining attached with its dead leaves, until it is blown off and drops to the ground, leaving the bare, tapering trunk to stand until it, too, is eventually brought down by the ravages of white ants.

A tapering palm felled at the second stage was characterized by a very small growing point containing an exceptionally high proportion of potash; the tapering portion of the stem was black, corrugated, and about 3 ft. long; the bole was hollow and rotten; and most of the roots were dead.

A noteworthy feature of the tapering disease is the juxtaposition of moribund and healthy, prolific palms, which do not suffer from the association. Repeated examinations of roots, leaves, and butt ends failed to reveal any pathogenic agent.

Tapering palms are found under all sorts of environmental conditions—on good and bad soils, on regularly cultivated and manured sites as well as on long-neglected areas with heavy undergrowth; near the sea and far inland; close to houses and in a village market. Various physical factors may be concerned in the extensive root destruction which is an important feature of the disease. The impoverishment of the soil by prolonged coco-nut cultivation on the same land without manuring may also be a factor. On a very high-yielding estate, where all husks are returned to the soil and the palms are regularly supplied with complete fertilizer, the first indication of tapering is a signal for the additional application to the soil in a semi-circle round the base of 1 lb. potash and six or seven baskets of cattle manure. At this incipient stage the palms can apparently be saved, but such an expensive treatment is economic only in the case of exceptionally good specimens. Others should be replaced by selected high-grade seedlings. This is the general practice in Ceylon, and at a recent inspection of one estate the 15-year-old supplies were already yielding fine crops and showed no signs of tapering.

Knight (R. L.) & Boyns (B. M.). **Agricultural science in the Sudan. A bibliography with abstracts.**—251 pp., Arbroath, T. Buncle & Co. Ltd., 1950. 20*s.* net.

This is a useful survey of 969 publications dealing with all branches of agricultural science with a direct relation to the Sudan [cf. *R.A.M.*, 29, p. 163]. Abstracts are given of many of the papers, including a number relating to cotton diseases.

Presley (J. T.). **Verticillium wilt of Cotton with particular emphasis on variation of the causal organism.**—*Phytopathology*, 40, 5, pp. 497–511, 4 figs., 1950.

Following a survey of the available information on the cotton wilt caused by *Verticillium albo-atrum* under the aspects of symptomatology, occurrence of the pathogen in virgin soils, and effect of fertilizers and soil amendments on its development [cf. next abstract], the author describes the confirmation at the Mississippi Agricultural Experiment Station of studies initiated in Arizona and reported in 1941 [*R.A.M.*, 21, p. 203] on the variability and genetic variation of the fungus in culture, its taxonomic significance, and varietal susceptibility to the disease.

In the present investigation between 30 and 75 monoconidial cultures were obtained from each of nine 'parental' cultures, consisting of one microsclerotial, two fluffy mycelial, one appressed mycelial, and five of the most commonly occurring microsclerotial plus mycelial types; all parental cultures were obtained from mass transfers from old cultures. The majority of the 352 isolates fell into four main cultural groups. Wide variations in cultural forms were observed, ranging from black microsclerotial with scanty mycelium (type A) to mycelial with no microsclerotia, these varying from very fluffy (B) to completely appressed mycelium (C). Microsclerotial production also varied greatly in the several cultures, some of

which gave rise only to dark, septate hyphae, others to small, discrete microsclerotia, while the black cultures contained very numerous, relatively large microsclerotia, imparting a gritty appearance to the entire surface.

Discussing the taxonomic significance of cultural variability in *V. albo-atrum* in the light of some important contributions to the subject [cf. ibid., 29, p. 333], the writer agrees with Rudolph's conclusion that most 'strains' and 'forms' of the wilt organism are merely variants of the species itself and should be so designated [ibid., 10, p. 757]. Thus, the counterparts of Bewley's six strains, based on microsclerotial production (*Rep. exp. Res. Sta., Cheshunt, 1920*, pp. 26–38, 1921), were found among the cultures derived from sectors of a monoconidial culture in the Mississippi experiments, while all van Beyma thoe Kingma's forms [*R.A.M.*, 19, p. 367] seem likewise to be represented in the present author's monoconidial cultures.

Pathogenicity to cotton was associated with cultural type in greenhouse inoculation tests with A, B, and C on the susceptible Stoneville 2B variety. The very virulent isolates of type A caused 51·4 per cent. infection and wilting began 14 days after inoculation, while the corresponding figures for B and C were 8·4 and 4·2 per cent. (19 and 21 days), respectively. All the upland cotton varieties tested in wilt-infested soil in Mississippi were highly susceptible except Hartsville, which showed marked resistance [cf. ibid., 29, p. 26].

Presley (J. T.). **Soil fumigation controls Cotton wilt in Mississippi.**—*Down to Earth*, 6, 1, p. 3, 3 figs., 1950.

In 1948, tests were carried out by the Mississippi Agricultural Experiment Station at Scott to determine the effect of soil fumigation on the development of *Fusarium* wilt [*F. vasinfectum*: *R.A.M.*, 28, pp. 15, 286], and at Clarksdale on *Verticillium* wilt [*V. albo-atrum*: ibid., 29, p. 302] in experimental plots of Delta and Pine Land cotton. At Scott [unspecified] nematodes were abundant over the wilt area, while no nematode injury was observed at Clarksdale. About 10 days prior to planting dowfume W–40 (ethylene dibromide) [ibid., 29, p. 194] was used at approximately 20 gals. per acre. The fumigant is not particularly toxic to the wilt organisms.

The treated plots at Scott yielded seed cotton averaging 2,000 lb. per acre, the untreated only 210 lb. One-half of the plots were fumigated again in 1949 at 10 gals. per acre, with the following results: plots treated in both years produced an average of 977 lb. seed cotton per acre, those treated only in 1948 795 lb., and the untreated 248 lb. At Clarksdale on fumigated plots the yield was 2,457 lb. and on the untreated 2,405 lb. The results suggest that the control of *Fusarium* wilt at Scott was indirect; no definite advantage resulted from fumigation of *Verticillium* infested soil.

The indirect control of *F. vasinfectum* by combating nematodes offers a practical approach to controlling a soil-borne disease by the application of a soil fumigant.

Matuo (T.). **On the 'sore shin' disease of grown-up Cotton plants and several other fibre-plants.**—*Ann. phytopath. Soc. Japan*, 13, 3–4, pp. 26–28, 1949. [Japanese, with English summary. Received May, 1950.]

The results of experiments, in which cotton plants at various growth stages were inoculated with a culture of *Corticium vagum* [*C. solani*: *R.A.M.*, 28, p. 65] isolated from a cotton seedling, showed that the plant was invaded by the fungus throughout the growing period, although susceptibility appeared to decline as the plant grew older. Percentage infection in seedlings was higher in wet than in dry soil but no great difference was found with adult plants. Inoculation experiments showed that the isolate was also pathogenic to adult hemp, *Abutilon*, jute, and flax plants.

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Fisher (Fran[cine] E.). **Two new species of Hirsutella Patouillard.**—*Mycologia*, 42, 2, pp. 290–297, 4 figs., 1950.

Descriptions are given of *Hirsutella besseyi* n.sp. on the citrus purple scale insect, *Lepidosaphes beckii*, and *H. thompsonii* n.sp. on the citrus rust mite, *Phyllocoptruta oleivora* [see next abstract]. The dead scales and mites were observed infested with the fungi during the summer and autumn of 1948 on citrus foliage near Lake Alfred, Florida.

Fisher (F[rancine] E.). **Entomogenous fungi attacking scale insects and rust mites on Citrus in Florida.**—*J. econ. Ent.*, 43, 3, pp. 305–309, 1950.

From the information at present available it may be concluded that one fungus, a species of *Myiophagus*, is a true parasite and is acting as a factor in the biological control of the purple and Florida red scales (*Lepidosaphes beckii* and *Chrysomphalus aeonidum*, respectively) on citrus in Florida. *Hirsutella besseyi* and *H. thompsonii* [see preceding abstract] may also be parasitic on purple scale nymphs and on rust mites (*Phyllocoptruta oleivora*) [cf. *R.A.M.*, 29, p. 26], respectively, but their pathogenicity has not been definitely proved.

[A reference to this work is also made in *Rep. Fla agric. exp. Sta*, *1949*, pp. 296–297, 1950.]

Limber (D. P.). **Ophiostoma on Narcissus bulbs.**—*Phytopathology*, 40, 5, pp. 493–496, 2 figs., 1950.

A species of *Ophiostoma* frequently observed since 1934 on *Narcissus* bulbs imported into New Jersey from other American States, England, and Ireland, causes a dark brown discoloration of the tissue, which remains fairly firm. On desiccation the decayed scales may turn nearly black or bleach to greyish-white. Ingress is usually effected through an injury, very often following the rupture of the outer scales which accompanies the splitting of the maturing bulb. The fungus, named *O. narcissi* n.sp., is characterized on potato dextrose agar by a greyish-white, later yellowish-tinted, appressed, rugose mycelium, the mat darkening with age through the abundant development of black, spherical, almost glabrous perithecia, 144 to 210 μ in diameter, furnished with one or rarely two smooth, straight or curved, black beaks (paler near the apex), 160 to 370 by 12 to 15 μ, the presence of which in the rotting tissue is the most reliable diagnostic feature; the ostiole is usually entire, but very occasionally the margin may be fimbriate owing to the separation of the hyphal strands of the beak near the apex; the small, globose or ovate, evanescent asci contain eight ovate to oblong, hyaline ascospores, 2 to 3·7 by 2 to 2·5 μ, discharged in a mass; the conidiophores, 2 to 50 by 1 to 2 μ, often taper to 0·8 μ at the apex, where denticulate sterigmata are borne in a whorl or singly, or they may be formed on very short branches on the conidiophore; the hyaline, continuous, clavate to ovate conidia measure 2·5 to 7 by 1·7 to 3 (usually 4 to 5·5 by 1·7 to 2·5) μ, and sometimes multiply by yeast-like budding. The new species differs from the related *O. stenoceras* [*R.A.M.*, 14, p. 274] in its larger perithecia, shorter, narrower, and rarely fimbriate beaks, and smaller, more symmetrical ascospores.

O. narcissi is generally confined to a limited area on one side of the bulb and does not penetrate beyond the second or third scale, but in association with insect pests it may be found in the deeper layers, hastening decay. In the few inoculation experiments so far performed the only result was a slight rotting round the scalpel incision. The fungus was able, however, to persist on the outer, dead scales of both wounded and intact bulbs, imparting to them a friable consistency with a tendency to disintegration on handling. It would thus appear to be a saprophyte or weak parasite, capable of causing decay under very favourable conditions.

Milbrath (D. G.). **Fleck of Easter Lily.**—*Bull. Dep. Agric. Calif.*, 39, 1, p. 3, 1 col. pl., 1950.

Fleck or necrotic fleck of Easter lily (*Lilium longiflorum*), caused by a complex of the common lily virus [lily symptomless virus] and cucumber mosaic virus [*R.A.M.*, 24, p. 18; 28, p. 563], occurs in parts of the United States where the lily has long been grown on a large scale. Either virus may survive in the plant or in part of it, and individually has no effect. The lily symptomless virus, regarded as a latent virus, is reported to occur in all commonly grown and old varieties of *L. longiflorum*. A seedling remains free from it when grown in isolation from older, infected plants. The cucumber mosaic component may be almost any one of the cucumber mosaic virus strains.

Simonds (A. O.). **Chemical treatment effects on Gladiolus.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 1, p. 50, 1949.

At the Colorado A & M College 1,500 Picardy *Gladiolus* corms were divided into 10 lots, of which nine were treated with various chemicals for the control of rot (*Fusarium*) [*oxysporum* f. *gladioli*: *R.A.M.*, 29, pp. 363, 466] and scab [*Bacterium marginatum*: ibid., 23, p. 300; 26, p. 453]. The lots were subdivided for six replications in a randomized planting on 8th May, 1948. The best results were obtained with the following: full-strength arasan dust; lysol at 60 ml. per 3 gals. water, the corms being soaked for three hours and planted while wet; 15 minutes' immersion in dowicide B, 6 oz. per 3 gals., followed immediately by planting; and the same procedure with new improved ceresan, 1 oz. plus 2 tablespoonsful dreft per 3 gals.

Thomas (W. D.) & Baker (R. R.). **Chemical inactivation of the Carnation mosaic virus in vivo.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 1, p. 51, 1949.

At the Colorado A & M College carnations infected by the mosaic virus [*R.A.M.*, 23, p. 19; 28, p. 334] were treated with a number of chemicals, which were introduced into the plants by means of a thread wick inserted into the stem and suspended in the solution. Virus activity was determined by the inoculation of susceptible plants of *Dianthus barbatus* with extracts from the test plants. A highly significant reduction of virus activity was obtained with sulphaguanidine, sulphasuxidine, sulphathalidine, and sulphamerazine, and a significant diminution with calcium chloride, p-aminobenzenesulphonylamide, and sodium diethyldithiocarbamate.

Baker (K. F.). **Bacterial fasciation disease of ornamental plants in California.**—*Plant Dis. Reptr*, 34, 5, pp. 121–125, 1950. [Multilithed.]

Fasciation disease (*Corynebacterium fascians*) [*R.A.M.*, 28, p. 274] occurs on many ornamentals during most seasons in California, but causes losses of economic importance only of Esther Read daisy (*Chrysanthemum maximum*). It was first observed on this host in various localities in southern California in 1945 on plants growing in irrigation ditches, and it reduced greatly the cut-flower production. The disease is now generally established in the southern part of the State. In March, 1950, it was reported to be destructive in a commercial planting in San Mateo county. Marconi daisy remained unaffected when growing among severely diseased Esther Read plants. *Tropaeolum majus* plants grown from seed in sterilized soil developed typical 'cauliflower growths' [ibid., 21, p. 282], which, however, were not observed in field plantings, where only infrequent witches' brooms were found. Of 13 varieties tested in the greenhouse in 1944, five had 1 to 3 per cent. infected seed, and three 4 to 6 per cent. [ibid., 18, p. 597]. *C. fascians* probably survives on rotation crops. Hot water seed treatment effectively eradicated the disease. The seed should be soaked for one hour in cool tap water, then treated for

30 minutes in water at 51·7° C. (125° F.), cooled at once, and dried within 12 to 20 hours. Sweet pea seedlings grown in soil to which pieces of the 'cauliflower' growth were added developed typical fasciation. No infected sweet pea plants were found, probably because they are grown during the cool season and receive little irrigation in the field, but the disease occurred on plants grown in the University greenhouses, Los Angeles, in 1945 and 1947.

In 1945 occasional *Petunia hybrida* plants (var. General Dodds) in a seed field in Santa Barbara county had basal leafy galls, and a single infected plant was observed in 1947 in a greenhouse. Single infections were found in Los Angeles on carnation, *Chrysanthemum morifolium*, *Pelargonium*, *Phlox*, and possibly *Rhododendron*.

A list (compiled from the literature) is presented of the host range of the pathogen, consisting of 34 genera in 21 families.

Baker (K. F.) & Davis (Lily H.). **Heterosporium disease of Nasturtium and its control.**—*Phytopathology*, 40, 6, pp. 553–566, 2 figs., 1950.

The following supplementary information on the destructive leaf spot of nasturtium (*Tropaeolum majus*) caused by *Heterosporium tropaeoli* in California is presented in this amplified account [*R.A.M.*, 26, p. 492; cf. also ibid., 28, p. 246]. The disease has also been reported from New York, Guatemala, and New South Wales. The pathogen is borne internally and externally in up to 93·2 per cent. of commercial 'seed', persisting for at least three years in the form of thick-walled mycelium in the pericarp and seed.

Røed (H.). **Botryotinia pelargonii n. sp., det perfekte stadium av en Botrytis av cinerea-typen på Pelargonium.** [*Botryotinia pelargonii* n.sp., the perfect state of a *Botrytis* of the *cinerea* type on *Pelargonium*.]—*Blyttia*, 7, pp. 65–79, 3 figs., 1949. [English summary.]

Following a brief review of the literature on the genetic connexion between the genera *Botrytis* and *Sclerotinia* [*R.A.M.*, 28, p. 546], the author reports a further example of an association of the same kind. A *Botrytis* of the *cinerea* type was isolated from a *Pelargonium* leaf submitted to the Norwegian Plant Protection Institute, Oslo, from a greenhouse at Frederikstad. Infection had originated at the lamina base and spread fanwise over the surface, which gradually turned brown. The pathogenicity of the fungus was apparently of a low order, dependent on the weakening of the foliage by extreme humidity.

A pure culture was obtained and placed in a refrigerator at 3° C. About a year later conidiophores had developed from most of the sclerotia, except in one tube which contained young apothecia. On transference to the light under humid conditions normal apothecia were produced and the relationship between the imperfect and perfect states of the pathogen was established by monoascospore cultures. On malt, potato, and potato dextrose agar conidia developed in profusion at 10° to 12° and amply at 20°, but sparsely at 26° to 27°. Sclerotial production was likewise abundant at 10° to 12° and 20°, but did not occur at 26° to 27°. At the lower temperatures mycelial growth was luxuriant on malt agar but scanty on the other substrata, while at 26° to 27° it was copious on all, especially malt agar.

Botryotinia pelargonii n.sp. is characterized by tubiform to cyathiform, grey-brown, dark-edged apothecia, 1·5 to 3 by 1 to 2 mm., with dark, slightly pilose, subrugose stalks, 6 to 10 mm. long, tapering to a width of 0·5 to 1 mm. at the base. The cylindrical or cylindro-claviform asci measure 125 to 150 by 7·5 μ and contain eight ellipsoid to fusiform or irregularly oblong, hyaline ascospores, 16·5 to 19 by 6 to 7·5 μ; the paraphyses are 100 by 1·5 to 2 μ. The conidiophores of the imperfect state, *Botrytis pelargonii*, are 600 to 800 μ or up to 3 mm. in length, the conidia hyaline to ashen-grey, ellipsoid to oval, sometimes slightly irregular,

8·5 to 16 by 7·8 to 13 μ, the microconidia hyaline, globose, 3 to 3·4 μ, and the sclerotia semi-globose to oblong, 1·5 to 7 mm., black without and grey-white within.

RØED (H.). **Sclerotinia trifoliorum Erikss. på Rødkløver i Norge. Et bidrag til lösning av Kløverproblemet.** [*Sclerotinia trifoliorum* Erikss. on Red Clover in Norway. A contribution to the solution of the Clover problem.]—*Tidsskr. norske Landtbr., 1949*, 9–10, pp. 251–262, 2 figs., 1949 (issued 1950).

A problem of great moment in Norwegian agriculture is the overwintering of clover. The not uncommon, practically complete dying-off of stands in some localities during the latter half of the winter is generally attributed partly to various forms of cold injury and partly to 'clover sickness' [*R.A.M.*, 29, p. 512], a complex associated with both physiological and biological factors. In Denmark and Sweden parasitic attacks by the clover rot fungus (*Sclerotinia trifoliorum*) are an important contributory cause of winter decline [ibid., 27, p. 498; 29, p. 249], but there are very few records of its occurrence in Norway during the last 60 years. In 1948–9, however, the writer investigated outbreaks of clover rot, some of them very destructive, in three localities in the east of the country, and is of the opinion that the disease is much more widespread than hitherto supposed. In this connexion a useful survey is given of important facts relating to the course of infection, the morphology and taxonomy of the pathogen, the factors affecting its development, and its prevention and control.

CHEO (P. C.) & LEACH (J. G.). **The stimulating effect of dung infusion on the germination of spores of Ustilago striiformis.**—*Phytopathology*, 40, 6, pp. 584–589, 1950.

A limiting factor in the study of *Ustilago striiformis* [*R.A.M.*, 27, p. 133] hitherto has been the difficulty of obtaining satisfactory and consistent chlamydospore germination. After testing many chemical solutions and various environmental factors at the West Virginia Agricultural Experiment Station, horse or cow dung infusions were found to be very effective as stimulants to spore germination in a collection of the smut from bluegrass [*Poa pratensis*]. Some of the spores in a dilute infusion began to germinate after five or six days and were succeeded by others for a period of over 25 days, by which time 60 to 90 per cent. had germinated. Germination of spores pre-soaked in the mass for 15 days or longer in a concentrated dung infusion and then dispersed in distilled water began within five hours and reached 60 to 90 per cent. in 20. The fact that autoclaved horse dung also gave an impetus to germination indicates that the stimulatory factor is thermostable. Its action does not appear to be nutritional, since the spores after pre-treatment with the infusion germinated much better in distilled water than in nutrient solutions of various kinds. The spores can be soaked for at least five months in a concentrated dung infusion at 25° or 2° C. without loss of viability and will germinate promptly on dispersion in distilled water.

HANSON (E. W.), MILLIRON (H. E.), & CHRISTENSEN (J. J.). **The relations of the Bluegrass billbug, Calendra parvula (Gyllenthal), to the development of basal stem rot and root rot of cereals and grasses in north-central United States.** *Phytopathology*, 40, 6, pp. 527–543, 4 figs., 1 graph, 1950.

Not only is the widely distributed billbug (*Calendra parvula*) of bluegrass (*Poa pratensis*) itself destructive to cereals (spring and winter wheats, rye, and barley) and grasses in the north-central United States, but in attacking the lower internodes and sometimes the roots, it provides channels of entry for the fungi causing basal stem and root rots, notably *Fusarium* spp. [cf. *R.A.M.*, 21, p. 21; see above, p. 551]; other species isolated were *Helminthosporium*, *Alternaria*, *Penicillium*, *Mucor*, *Epicoccum*, and *Colletotrichum*. The pathogens are also carried both in and on the

bodies of the insects. *Calendra parvula* may be combated by sound cultural practices, including judicious crop rotation.

Hafenrichter (A. L.), Mullen (L. A.), & Brown (R. L.). **Grasses and legumes for the Pacific Northwest.**—*Seed World*, 67, 2, pp. 8–10, 7 figs., 1950.

Resistance to the diseases, especially head smut [*Ustilago bullata*], commonly affecting mountain brome (*Bromus marginatus*) in the Pacific Northwest [*R.A.M.*, 27, p. 240] is a characteristic of the Bromar variety developed at the Regional Nursery Division, U.S. Soil Conservation Service, Portland, Oregon. It is intermediate between the short, early, prolific and the tall, robust, coarse, late types, and is eminently suited for mixed cultivation with sweet clover [*Melilotus*]. Certified seed of Bromar is on the market.

Bruehl (G. W.). **Heat banding of Crested Wheatgrass seedlings.**—*Phytopathology*, 40, 5, pp. 522–524, 1 fig., 1950.

Crested wheat grass (*Agropyron cristatum*) seedlings in the greenhouse at the South Dakota State College sustained a specific form of damage, presumably due to excessive heat and desiccation of the young leaf tissues at soil-level in March and April, 1949. Many of the leaf blades were broken over at a point of severe local necrosis. This fragile necrotic area was bleached white, but the distal portion frequently retained its green coloration, denoting continued functioning of the vascular elements. Bands of discoloured chlorenchyma in the still upright blades were similar to those described by Vanterpool in cereal seedlings [*R.A.M.*, 29, p. 253]. The colour of the affected zones ranged from reddish to purplish and in some cases conspicuous atrophy resulted. The necrotic bands were generally situated about 1 cm. above soil-level, two zones being separated by an interval of 1 or occasionally 2 cm.

Attempts at the isolation of micro-organisms gave negative results, and their intervention is considered improbable since the disturbance was equally severe on chloropicrin-treated soils. It was greatly aggravated by low soil moisture, 24, 13, and 1 per cent. of the total number of seedlings included in an etiological study dying at the 30, 40, and 50 per cent. levels, respectively. Air temperatures of 100° F. occurred during the day, and the capacity for heat absorption of the dark silt loam soil was high.

Langdon (R. F. N.). **Studies in Australian ergots. 1. Claviceps pusilla Cesati.**—*Pap. Dep. Biol. Univ. Qd*, 2, 12, pp. 1–12, 1950.

Claviceps pusilla is not uncommon in the latter part of the summer and in the autumn on a number of native grasses in Queensland [*R.A.M.*, 22, p. 437]. There may be considerable infection as early as January if storm rains occur in October. In areas where *Cerebella* [ibid., 21, p. 526] is not found, abundant sclerotia may be formed, which act as reservoirs of inoculum to spread the disease in the following season. *Claviceps pusilla* may be regarded as a potential source of stock poisoning. Infection of the native pasture grasses for several years might result in pasture deterioration through failure of the natural seeding process.

The morphology, hosts, sclerotia germination, and infection experiments are described. Hosts detected in 1949 include *Veteveria filipes* and *Dichanthium annulatum*. There does not appear to be more than one strain of the fungus.

Grasso (V.). **Studio sulle Claviceps italiane.** [A study on Italian species of *Claviceps*.]—*Ric. sci.*, 19, 10, pp. 1164–1168, 5 figs., 1949.

In this preliminary account of his studies on *Claviceps* in Italy [cf. *R.A.M.*, 28, p. 404] the author lists the infected members of Gramineae so far found by him (mostly near Florence). The presence or absence of sclerotia and of the *Sphacelia*

[see next abstract] state is noted for each record. The species found comprise *C. purpurea* [ibid., 19, p. 525; 28, p. 448], *C. microcephala* [ibid., 16, p. 447; 17, p. 269], *C. paspali*, and *C. sesleriae*.

Grasso (V.). **Un nuovo metodo per la ricerca delle f. c. Sphacelia.** [A new method for obtaining f.c. *Sphacelia*].—*Ric. sci.*, 19, 9, pp. 1021–1022, 1 fig., 1949.

Spikes of *Lolium perenne* and *Festuca elatior* suspected of being infected by *Sphacelia* states of *Claviceps* spp. [see preceding abstract] were fixed upright in wet sand in a Petri dish and covered with a bell-jar containing damp blotting paper. Next day the plants showed numerous conidia.

Donatelli (L.), Grasso (V.), & Pettinelli (Q.). **I principi attivi di alcune Claviceps italiane.** [The active principles of some Italian species of *Claviceps*.] —Reprinted from *Boll. Soc. ital. Biol. sper.*, 25, 3, 2 pp., 1949.

A table is given showing the quantities of total alkaloids, insoluble and soluble alkaloids, and starches contained in the sclerotia of *Claviceps purpurea* from *Lolium perenne*, *Festuca elatior* [see preceding abstracts], and rye, *C. paspali* from *Paspalum distichum*, *C. sesleriae* from *Sesleria caeruleus*, and a species from *Cynodon dactylon* in Italy. The high alkaloid content of the sclerotia of the species on *Cynodon dactylon* and of *C. purpurea* on *L. perenne* suggests that therapeutic use might be made of them.

Rosemblit (A.). **La Ascochyta de la Alfalfa en la Argentina.** [The *Ascochyta* of Lucerne in Argentina.]—*Rev. argent. Agron.*, 17, 2, pp. 89–97, 3 figs., 1950. [English summary.]

Black stem of lucerne (*Ascochyta imperfecta*) [*R.A.M.*, 29, pp. 213, 367] has been observed in several localities of the province of Buenos Aires, where the Peruvian variety is particularly susceptible. An undetermined species of *Ascochyta* on the same host was reported from Santa Fé in 1939, but the present appears to be the first definite record of the disease for Argentina. Inoculation experiments on lucerne, *Medicago falcata*, *M. lupulina*, *Melilotus alba*, and clover (*Trifolium repens* and *T. hybridum*) gave positive results on the two first-named only. The initial symptoms developed on the leaves before reaching the stem. The fungus was readily re-isolated from the inoculated hosts and throve on various standard media, growth being most luxuriant on 2 per cent. malt agar, while pea pod agar stimulated pycnidial production. An apparently permanent mycelial variant, producing no pycnidia, was isolated from a sectional mutation in an otherwise normal culture. The mycelial variant grew very slowly in comparison with the pycnidial form on 2 per cent. potato dextrose agar. Some of the pycnidiospores were continuous and others uniseptate. Their dimensions on potato dextrose agar were 7 to 8 by 3 to 4 μ, on dry stems 8 to 12 by 3 to 4 μ, and on fresh material 15 to 19 by 4 to 5 μ.

Black stem is most prevalent in humid weather, autumn dews, for instance, promoting its development. The propagation and perpetuation of the pathogen are effected by means of the seed and field refuse.

Diachun (S.) & Valleau (W. D.). **Tobacco streak virus in Sweet Clover.**—*Phytopathology*, 40, 5, pp. 516–518, 1 fig., 1950.

In a test at the Kentucky Agricultural Experiment Station on 17th April, 1948, two or three of the youngest leaves of 75 potted six-week-old sweet clover [*Melilotus alba*] plants were dusted with carborundum and rubbed with the liquid squeezed out through cheesecloth from young *Nicotiana rustica* leaves infected by the tobacco streak virus [*R.A.M.*, 19, p. 567; 29, p. 461], after crushing with an equal volume of M/10 sodium phosphate. Within two days local symptoms

developed on the rubbed leaves of 19 plants, and within four days 57 had contracted infection. Systemic infection first became apparent 13 days after inoculation and by the 16th, 20th, and 27th day it involved 6, 25, and 27 of the plants, respectively. In a second test positive results were obtained in 24 out of 99 inoculations, and in a third 117 plants out of 120 showed lesions in five days and eventually 36 became systemically infected.

The symptoms of tobacco streak on sweet clover (an important natural host in Kentucky) have not previously been described in detail. The local lesions on the leaves consisted for the most part of chlorotic spots, 1 to 2 mm. in diameter, often with a small, necrotic centre, but necrotic spots and small necrotic rings also occurred. Chlorotic spots situated on the veins often extended along them, two or more sometimes forming yellow bands by coalescence over the major portion of the vein. Systemic infection showed initially on the youngest leaves chiefly as chlorotic spots, up to 1·5 mm. in diameter, with minute, necrotic centres. In some cases the main portion of the spot was necrotic with a narrow, chlorotic border or halo. Sometimes the leaflets were bleached, apparently through the coalescence of many minute, white necrotic spots. Killing of the leaflets was observed occasionally. At this stage the plants made slow growth and appeared stunted. Subsequently newly formed leaves were sometimes dwarfed or pinched and often developed chlorosis in the shape of large, yellow areas or a number of yellow specks. As a rule the leaflets were mildly chlorotic or faintly mottled, often with irregular margins.

Streak symptoms on sweet clover have not yet been recognized in the field. In the greenhouse they are readily distinguishable from those of common sweet clover virus (bean yellow mosaic) [ibid., 29, p. 284] and another unidentified virus of *M. alba*.

Brooks (L. E.) & Harvey (C.). **Experiments with Guar in Texas.**—*Circ. Tex. agric. Exp. Sta.* 126, 10 pp., 2 figs., 1950.

Guar (*Cyamopsis tetragonoloba*), a hardy, drought-resistant legume introduced into the United States from India in 1903, and used as a green manure or for fodder, was shown by experiments at Iowa Park, Texas, from 1929 to 1933 to be tolerant of cotton root rot (*Phymatotrichum omnivorum*). Though it contracted a high percentage of infection (average of 81·6 for the five-year period) most of the plants survived to maturity and produced seed. It is susceptible to southern blight (*Sclerotium rolfsii*) [*R.A.M.*, 28, p. 295].

Příhoda (A.). **Rez Uromyces renovatus Sydow na Lupině.** [The rust *Uromyces renovatus* Sydow on Lupin.]—*Ochr. Rost.*, 21, 3–4, pp. 37–43, 1 fig., 1948. [French summary. Received July, 1950.]

A description is given of *Uromyces renovatus* [*R.A.M.*, 18, p. 549; 26, p. 30], found by the author on a specimen of lupin in Dr. F. Bubák's herbarium at the Phytopathological Institute of the Agricultural and Forestry School of Engineering, Prague. This represents the only record for Czechoslovakia. It was collected in 1924 at Slapy, near Tábor.

Jensen (D. D.). **A Crotalaria mosaic and its transmission by aphids.**—*Phytopathology*, 40, 5, pp. 512–515, 1 fig., 1950.

In 1931 a mosaic disease of *Crotalaria* [see next abstract] was reported from Hawaii [*R.A.M.*, 11, p. 116], and in 1945 and 1946 it was again prevalent on *C. incana* over a large part of its range on the island of Oahu. In the latter year the results of experiments under controlled conditions in the greenhouse demonstrated the transmissibility of the virus by *Aphis gossypii* and *Myzus persicae*, of which the former seemed to be the more efficient of the two vectors (92·8 and 54·5 per cent.

infection, respectively). None of the 1,600 seeds collected from diseased *C. incana* (12 per cent. germinated) and *C. mucronata* (1,600, 15 per cent.) gave rise to mosaic seedlings.

The first symptom of infection, clearing along the veinlets and lateral veins of the youngest leaves, appeared between six and ten (average eight) days after inoculation in the greenhouse as compared with five in the field. Four days later much of the intervenal tissue of newly developing leaves turned abnormally pale, while the expanding axillary leaves were stunted and showed clearing along the veins and in some of the intervenal tissue. After the lapse of a further six to nine days, the new growth was only half the normal size, and the expanding foliage was also distorted, with puckered or blister-like areas and irregular rolling of the margin. Within a fortnight after the onset of the disease all young plants showed conspicuous patches of light and dark green tissue on the dwarfed and misshapen leaf blade. With the further progress of infection, the leaves became increasingly stunted and distorted, some appearing filiform and rolled, with shortened internodes and general dwarfing of the plant. The abnormal stimulus to axillary growth also confers extreme bushiness.

Similar diseases of *Crotalaria* have been reported from Virginia [ibid., 17, p. 429], Puerto Rico [ibid., 10, p. 810], Trinidad [ibid., 23, p. 203], India [ibid., 29, p. 200], and Japan [ibid., 11, p. 797].

Raychaudhuri (S. P.) & Pathanian (P. S.). **A mosaic disease of Crotalaria mucronata Desv. (C. striata DC.).**—*Curr. Sci.*, 19, 7, p. 213, 1 fig., 1950.

A mosaic disease of *Crotalaria mucronata* [see preceding abstract] prevalent at the Indian Agricultural Research Institute, New Delhi, appears first on the youngest leaves in the form of pale areas. An occasional slight downward curling of the leaf tips disappears later and typical mosaic mottling develops on the lamina, with a few pale intervenal areas on the older leaves. This form of mosaic, unlike that reported on *C. juncea* [*R.A.M.*, 29, p. 413], is rarely accompanied by foliar stunting or blistering.

The virus is readily transmissible by the sap to its own host, *C. juncea*, cowpea, *Phaseolus mungo*, and *P. aureus*, the symptoms appearing in seven to 12 days after inoculation. Its thermal death point lies between 80° and 85° C., longevity *in vitro* extends over a period of 134 to 142 days in storage at 12° to 15°, and a dilution of crude sap of 1 in 20,000 to 1 in 30,000 is tolerated.

A mosaic disease of *C. mucronata* previously described [from Puerto Rico: ibid., 10, p. 809] causes dwarfing of the plant and lowers seed production, but is not seed-borne. Phyllody of the same host has been observed in Bombay [ibid., 18, p. 181].

Brough (C. R.). **Zinc deficiency in deciduous fruit trees in Victoria.**—*J. Dep. Agric. Vict.*, 48, 6, pp. 257–259, 5 figs., 1950.

A description is given of the symptoms and methods of controlling zinc deficiency in apple, pear, peach, and plum trees, which now occurs in the Harcourt, Quantong, and Pakenham areas of Victoria, as well as in the Goulburn Valley and Horsham districts [*R.A.M.*, 27, p. 568].

Swartwout (H. G.). **DN-111 toxic to sooty blotch.**—*Down to Earth*, 6, 1, p. 2, 1 fig., 1950.

Observations incidental to phytotoxicity tests carried out in 1949 in the University Orchard, Columbia, Missouri, revealed that seven applications of 1–100 DN–111 (20 per cent. dinitro-*o*-cyclohexylphenol dicyclohexylamine salt) in combination with four of 2–100 sulphur arrested effectively the development of sooty blotch [*Gloeodes pomigena*: *R.A.M.*, 16, p. 21; 28, p. 210] on Golden Delicious

apples. Trees which received in addition DDD emulsion (dichlorodiphenyldichloroethane) were entirely free from the disease. DN–111 appears to be a promising material, as it could be used both as a fungicide and an acaricide. It leaves very little visible residue on the fruit.

Vuittenez (A.). **Nouveaux essais de traitements complémentaires de la tavelure du Poirier. Traitements d'hiver.** [New complementary spraying trials against Pear scab. Winter treatments.]—*C. R. Acad. Agric. Fr.*, 36, 4, pp. 155–158, 1950.

A test was carried out in an orchard near Paris of the efficiency of various spray materials in suppressing the development of the perithecia of *Venturia pirina* and *Mycosphaerella sentina* [*R.A.M.*, 29, p. 217] in fallen leaves of Passe Crassanne, Beurre d'Hardenpoint, and Doyenné du Comice pears. The first spray was applied on 18th March, 1948, as the perithecia began to mature, and two later treatments were applied to well-matured perithecia.

Spray applications of 5 per cent. sulphuric acid or sodium hydroxide or thorough sprinkling with milk of lime reduced ascospore ejection by 99·8 per cent. Sodium dinitrophenate (2 per cent.) and 12 per cent. ammonium sulphate caused a reduction of 94 to 99 per cent. and presented no danger to operators, soil, or plants. Such treatments, however, must be thoroughly and generally applied before good results can be obtained.

New dip oil tested.—*Aust. Dried Fruits News*, 25, 7, p. 5, 1950.

In connexion with a report on the highly satisfactory results of trials in South Australia in 1949 with a new product for the drying of sultanas and currants known as Mobil Fruit Dipping Oil, recommendations are made for [unspecified] mould control by burning sulphur in shallow pans, using 3 to 4 lb. per pan for sultanas, with a pan under every bay of drying racks, and 2 to 3 lb. for currants, with a pan under alternate bays. The drying racks should be enclosed as thoroughly as possible by side curtains.

The best fungicidal spray is 2·5 per cent. potassium carbonate cold dip mixture plus 1 per cent. shirlan WS. The fruit thus treated should be washed in the packing house to remove spray residue.

Snell (W. H.). **Garden Red Currants and White Pine blister-rust.**—*J.N.Y. bot. Gdn*, 51, 608, pp. 187–190, 1950.

The author brings forward evidence from his own observations over a number of years in the eastern United States to show that red currants do not appear to be implicated in the spread of blister rust [*Cronartium ribicola*: *R.A.M.*, 21, p. 533; 29, pp. 105, 517] to white pines [*Pinus strobus*]. Counts of leaves on cultivated black and red currants and wild gooseberries [*Ribes cynosbati* and *R. rotundifolium*] showed that they averaged 4,000 or 5,000 leaves per bush. A figure of 77 per cent. (which is low) was taken as an average of the amount of infection generally present on black currants and 20 per cent. on wild gooseberry, and 2·3 per cent., a much higher figure than the average, was adopted for red currant. Using calculated percentages of infection and numbers of sporidia typically produced per unit of infection, the possible total number of sporidia for black currant was found to be approximately over 2,000,000,000,000, for wild gooseberries over 260,000,000,000, and over 33,000,000,000 for the red currants, a ratio of roughly 70:8:1.

Black currants have been recorded as being dangerous to white pine up to a distance of 6,600 ft. [cf. ibid., 24, p. 40], and wild gooseberries up to 750 ft.; the dangerous distance for cultivated red currants, therefore, would seem to be under 100 ft. It is concluded that red currants cannot be considered dangerous to white

pines, as they are so resistant to *C. ribicola* that they are unable to produce a sufficient number of spores under any conditions.

Waldo (G. F.). **Breeding Blackberries.**—*Bull. Ore. agric. Exp. Sta.* 475, 38 pp., 14 figs., 1950.

This bulletin contains some observations (pp. 27–28) on breeding for resistance to leaf spot (*Mycosphaerella rubi*) of blackberry in Oregon [*R.A.M.*, 17, p. 190], accompanied by a table (p. 29) showing four degrees of resistance in six groups of crosses. Maximum resistance was found among the seedlings from crosses between the European blackberry and loganberry and Phenomenalberry, of which 43·5 per cent. were highly resistant and only 6 per cent. very susceptible. Next are those with Boysenberry as one parent (17·9 and 8·3, respectively), followed by the offspring of crosses with Logan, Phenomenal, or a Logan cross as one progenitor (22 and 20·8, respectively). Of the native western varieties used as parents, Branstetter seems to confer the highest degree of resistance, while Oregon 217 × Pacific, both parents of which derive from Zielinski × Logan, also yielded many resistant seedlings.

Wade (G. C.). **Strawberry diseases in Tasmania.**—*Tasm. J. Agric.*, 21, 2, pp. 95–99, 5 figs., 1950.

Notes are given on the symptoms and control of the principal diseases affecting strawberries in Tasmania [cf. *R.A.M.*, 25, p. 329]. The most widespread and serious is crinkle virus [ibid., 27, p. 140; 29, p. 160], both severe and mild strains being present. The Ettersburg variety ('Tree') is relatively tolerant of the mild strains. Yellow edge [ibid., 27, p. 140; 28, p. 342] also occurs. The Department of Agriculture maintains certified stocks free from severe strains of crinkle and from yellow edge.

The most prevalent fungal diseases are leaf spot (*Mycosphaerella fragariae*) [C.M.I. map no. 110], leaf scorch (*Diplocarpon earliana*) [ibid., 27, p. 430], root rot of the Ettersburg variety associated with various soil fungi, including *Cylindrocladium scoparium*, *Fusarium* spp., *Pythium* sp., and *Rhizoctonia* [*Corticium*] *solani* [cf. ibid., 28, p. 21], and fruit rots, chiefly grey mould (*Botrytis*) [? *cinerea*: cf. ibid. 27, p. 430; 28, pp. 159, 180] and leak (*Rhizopus nigricans*) [*R. stolonifer:* ibid., 19, p. 26].

Non-parasitic disorders are those due to waterlogging and a scorching of the leaf margins by excessive applications of fertilizers.

Baker (R. E.) & Baker (G. A.). **Experimental design for studying resistance of Strawberry varieties to Verticillium wilt.**—*Phytopathology*, 40, 5, pp. 477–482, 1950.

In further investigations at the Agricultural Experiment Station, Davis, California, a considerable body of data on the resistance of strawberries to *Verticillium albo-atrum*, as measured by a rating system applied to field plants, has been obtained from two uniformity trials on the Shasta and Lassen varieties in a randomized block test with 27 varieties and four replications [*R.A.M.*, 28, p. 342].

Less variation between plots occurred where the plots were taken across rather than with the rows. Plots of 50 plants appear to be reasonably adequate. Variety and location govern both the variance of a plot and the means of plots within a block. The observed error variance is ten times as large as expected for straight analysis of variance of average ratings of 50-plant plots for the randomized block trial. For the average ratings the observed error variance is still eight times as large as expected, but intervarietal separation seems to be much sharper. The analysis of transformed percentages of plants in categories 1 and 2 (plant dead and heavy infection, respectively) also reveals sharp intervarietal distinction. The error variances for the randomized block experiment and the uniformity trials

divided into similar plots do not differ significantly. The ranking of selections is important and may vary appreciably with the method of distinguishing between them. The best agreement with field ratings was obtained by the analysis of transformed percentages and percentages calculated disregarding replications. An improvement in inoculation methods or in the preparation of the soil before planting might prove very helpful in overcoming the disturbance of the mean and variances of ratings in small plots caused by soil conditions.

Brémond (P.), Jourdan (M.), Berger (G.), & Bouhelier (R.). **Parasites et affections diverses de l'Olivier.** [Parasites and various disorders of the Olive tree.]—12 pp., Travaux Service Défense Végétaux, Maroc, [? 1950].

Brief, popular notes are given on the symptoms and control of the principal diseases affecting olive trees in Morocco, including leaf spot (*Cycloconium oleaginum*) [*R.A.M.*, 28, p. 467], sooty moulds [loc. cit.], heart rot caused by *Polyporus* spp., *Stereum* spp., etc., following pruning wounds, 'tuberculosis' (*Bacterium* [*Pseudomonas*] *savastanoi*) [C.M.I. map no. 135], sun scorch, and branch withering caused by drought.

Ciccarone (A.). **Considerazioni biologiche e sistematiche sull' agente della 'lebbra' delle Olive, recentemente osservata nel Leccese.** [Biological and systematic considerations on the agent of Olive 'leprosy', recently observed in Lecce.]—*Boll. Staz. Pat. veg., Roma*, Ser. 3, 5, pp. 143–165, 10 figs., 1 graph, 1947 (published 1950). [English summary.]

A full account is presented of the author's study of olive anthracnose (*Gloeosporium olivarum*) [*R.A.M.*, 29, p. 267], now recorded from the province of Lecce, Italy. When cultures of the fungus were compared with cultures of *G. fructigenum* [*Glomerella cingulata*: ibid., 14, p. 596] from apple only slight differences were noted. When wounded and unwounded olive, apple, and pear fruits were experimentally inoculated with two isolates of the olive fungus and one of *G. cingulata*, positive results were obtained in all cases. The symptoms caused by both were very similar and the morphological and cultural characters of the fungi were identical. The author therefore concludes that the two organisms are fundamentally the same.

The disease is susceptible of control by improved cultural practices. Spraying tests with various fungicides are to be carried out later.

Dodds (K. S.). **The breeding of disease-resistant Bananas.** —*World Crops*, 2, 2, pp. 56–59, 5 figs., 1950.

An interesting account is given of the methods and results to date of the work in progress in Jamaica on the development of resistance in bananas to Panama disease (*Fusarium oxysporum* var. *cubense*) and *Cercospora* leaf spot (*Mycosphaerella musicola*) [*R.A.M.*, 29, p. 459]. Two representatives of *Musa acuminata*, one a Burmese form with a vertical bunch of short fruits and the other an edible Malayan with a horizontal bunch of fairly long ones, immune from both diseases, are being used as male parents, and Gros Michel, which is pre-eminently suited to the export trade, as the female. The first phase of the operations, up to 1939, resulted in the production of some reasonably good immune seedlings with distinct commercial possibilities. Their fruits, however, were somewhat shorter than those of Gros Michel, for which reason they failed to satisfy the exacting requirements of the overseas trade. The second phase, now proceeding, is bringing into use improved male parents from which it should be possible to obtain seedlings free from the shortcomings of the earlier ones.

In the meantime Jamaica has begun to cultivate and export the Lacatan banana, a variety of the Cavendish type immune from Panama disease but very susceptible

to leaf spot, necessitating routine spraying with Bordeaux mixture. Its substitution for Gros Michel can only be regarded, therefore, as an interim measure pending the establishment of immune varieties. Lacatan fruits must be transported at a temperature of 58° F.

THOROLD (C. A.). **Manurial experiments with Papaw (Carica papaya).**—*Trop. Agriculture, Trin.*, 26, 7–12, pp. 129–132, 1949.

Experiments carried out at the St. Augustine Experiment Station of the Department of Agriculture, Trinidad, showed that although the incidence of papaw mosaic disease [*R.A.M.*, 18, p. 808] was not reduced by manurial applications yields were increased by two applications of coco-nut meal at about 5 tons per acre each. When combined with artificial fertilizers, yields were significantly higher at 6 by 6 ft. spacing, but 3 by 3 ft. is recommended for commercial practice to ensure a good stand at the first planting. The author considers rapid growth and early fruiting to be important objectives rather than attempting control by cutting back [loc. cit.], which delays fruiting. One or two applications of complete fertilizer at about 1 ton per acre are recommended.

JEFFERS (W. F.). **New developments in the field of spray and dust application.**—*Rep. Md agric. Soc., 1946*, 31, pp. 111–113, 1947. [Received April, 1948.]

Notes are given on recent developments [in the United States] in spraying and dusting equipment, including the speed sprayer, the fog applicator, the axial flow turbine, which operates for dusts or sprays by means of a turbine-like fan revolving at about 3,500 r.p.m. to produce an air blast of 100 m.p.h. or more, improved boom spray applicators, multi-outlet dust applicators, and the use of aeroplanes [*R.A.M.*, 29, p. 39].

The 'Cornell Sprayer-Duster' which is being tested for the application of small quantities of concentrated material, is a high volume, low velocity duster with an atomizing attachment that injects a liquid into the dust stream. It is said to be capable of giving good coverage of average sized apple trees with 1½ lb. dust plus 1½ gals. water. About 15 gals. spray would be required for standard sprayers.

COLBURN (R. A.). **Grain and seed cleaning plant.**—*World Crops*, 2, 9, pp. 389–393, 5 figs., 1950.

Brief descriptions are given of various types of machines for seed cleaning, and one for dressing seed grain with mercurial fungicides (agrosan powder dresser). The lay-outs for a single-purpose cleaning unit and combined plants are discussed.

Aerial dusting from fixed wing aircraft.—*World Crops*, 2, 9, p. 383, 1 fig., 1950.

In a demonstration of aerial dusting in Great Britain, a special modified Tiger Moth aeroplane was flown from a height of 8 ft., dusting a plot about 30 ft. wide at the rate of 30 lb. per acre. The dusting equipment consists of a hopper mechanism (up to 500 lb. capacity) built into the forward cockpit, from where the dust is fed to a 48-in. 'sprayer' mounted below the trailing edge of the lower wing. Clogging of the dust is eliminated by an agitator, and an air scoop promotes suction.

A new fine, freely flowing dust has been developed by Plant Protection Ltd. which mixes effectively with fungicides and insecticides and sinks quickly on to its target.

THORNBERRY (H. H.). **A paper-disk plate method for the quantitative evaluation of fungicides and bactericides.**—*Phytopathology*, 40, 5, pp. 419–429, 4 graphs, 1950.

The paper disk plate method for the assay of streptomycin (*J. Bact.*, 50, pp. 701–709, 1945) has been modified for the evaluation of fungistatic, fungicidal,

bacteriostatic, and bactericidal substances in aqueous or alcoholic solutions, using a non-varying stock of spores of the test organism, *Bacillus subtilis*. The optimal volume of liquid to be applied to the pads is 0·09 ml. for aqueous solutions and 0·08 ml. for alcoholic. Concentration of a substance in a solution can be assayed by applying the values of the zones of inhibition to a standard curve plotted from values of known concentrations of the chemical. The method is applicable for the evaluation of disinfectants that are mainly non-ionizable in water or ethanol, but not for that of cationic toxicants. It may be used, with the necessary modifications, for other test organisms and for testing spray or dust residues on foliage or glass slides.

Engelhard (H.), Müller (O.), & Bertl (K.). **Oberflächenspannung und fungicide bezw. baktericide Wirkung.** [Surface tension and fungicidal or bactericidal action.]—*Naturwissenschaften*, 34, 7, pp. 218–219, 2 graphs, 1947.

The results of experiments with '*Penicillium glaucum*' to determine the relationship between surface tension and fungicidal activity showed that the influence of homologous alcohols (except for the anomalous behaviour of methyl alcohol) may be almost ideally represented by Traube's law up to the delimitation through solubility with cetyl alcohol. According to Gibbs's theory an equal number of molecules in the surface of a solution or in the *Penicillium* spore solution corresponds to an equal surface tension. The transition from an alcohol to an ester, hexyl lactate, shows the dependence of this relationship on the accumulation of an equal number of molecules in the surface of contact, i.e., the site of reciprocal action between spore and fungicide. With a surface tension lying between hexyl alcohol and octyl alcohol, hexyl lactate exerts a corresponding efficiency. Thus, the efficiencies of hexyl alcohol, hexyl lactate, and octyl alcohol are rated at 0·02, 0·05, and 0·003, respectively, corresponding to surface tensions (in dynes per cm. at mol 0·002) of 68·2, 54·1, and 40·1, respectively.

Tirelli (M.) & Solaroli (G.). **Un metodo per valutare i danni fitosanitari.** [A method of estimating plant disease damage.]—*Riv. fitosan.*, 1, 3, pp. 27–32, 1947. [Abs. in *Boll. Staz. Pat. veg., Roma*, Ser. 3, 5, pp. 141–142, 1947 (published 1950).]

The method described for estimating total damage to crops by diseases over large areas consists in outlining the affected areas on maps in such a way as to show the various percentage losses, as determined by direct observation. The total area affected is then calculated and thence the total loss.

Plant protection service.—*Agric. Anim. Husb., Uttar Pradesh*, 5, ii+30 pp., 10 pl., 1950.

An account is given of the organization of the plant protection service established in the Uttar Pradesh, India, in 1947, followed by notes on the work done on the control of numerous plant pests and diseases. The major diseases occurring in the area are listed in an appendix.

Collins (W. F.), Wild (H.), & Hopkins (J. C. F.). **Poisonous plants of the Marandellas district.**—*Rhod. agric. J.*, 47, 2, pp. 106–125, 5 pl. (4 col.), 1950.

It is stated on p. 111 of this paper that the three well-known, poisonous fungi in the Union of South Africa, *Amanita pantherina*, *A. muscaria*, and *A. phalloides* [cf. *R.A.M.*, 27, p. 46] have not yet been recorded from Rhodesia. A description is given of maize cob rot caused by *Diplodia zeae* [ibid., 23, p. 100] and its poisonous effects on cattle.

Marchionatto (J. B.). **Tratado de fitopatología.** [Treatise of phytopathology.]—537 pp., 232 figs., Buenos Aires, Ediciones Libreria del Colegio, 1948. [Received August, 1950.] $40 Arg.

The 16 chapters of this treatise, which was preceded in 1944 by a manual describing the principal diseases of economic plants in Argentina and their control [*R.A.M.*, 24, p. 280], deal, respectively, with the history of phytopathology; the study of disease; parasitism and immunity; international co-operation in plant health; phytopathogenic fungi; diseases induced by fungi (pp. 111–394); parasitic phanerogams; virus diseases; diseases induced by viruses; physiogenic diseases; diseases induced by physiogenic agencies; plant therapy; commercial preparations; and home-made preparations. A 29-page bibliography, a glossary of technical terms, an index of hosts and diseases, and an alphabetical subject-index are appended.

Watson (R. W.), Clement (Mary T.), & Muirhead (D. R.). **The sterilization of glass and calomel electrodes by ultra-violet irradiation.**—*Canad. J. Res.*, Sect. C, 28, 2, pp. 183–196, 2 diags., 1950.

In the course of this investigation at the Division of Applied Biology, National Research Laboratories, Ottawa, on the sterilization of glass and calomel electrodes by means of ultra-violet irradiation, it was found that *Aspergillus niger* was the most resistant contaminant [*R.A.M.*, 26, pp. 310, 558], clumps of up to 40 spores becoming air-borne. These clumps required approximately 60,000 μw. min. per cm.^{2} at 2537 Å for inactivation. Used with the accessory procedures, exposure to 680 μw. per cm.^{2} for two hours was found to provide a safe margin and to ensure sterilization of carefully cleaned and specially mounted electrodes.

Shoemaker (R. N.). **A new microculture slide.**—*Science*, 112, 2898, p. 53, 1 fig., 1950.

A standard glass microscope slide for both temporary and permanent mounts, having an unpolished channel $\frac{1}{2}$ in. wide, slightly less than 1 mm. deep, and located $\frac{3}{4}$ in. from one end of the slide has been used successfully for culturing fungi in the laboratories of Chas. Pfizer and Co., Brooklyn, New York. After sterilization a sterilized 18 mm. cover slip is placed over the channel and melted seeded agar introduced beneath it until part of the space is filled by capillarity. The slide may then be incubated in a moist chamber.

Barrat (R. W.) & Tatum (E. L.). **A simplified method of lyophilizing micro-organisms.**—*Science*, 112, 2900, pp. 122–123, 2 diags., 1950.

In the lyophil method in use at Stanford University, California, the 0·1 ml. sample is pipetted into a 12 in. piece of 8 mm. pyrex tube sealed at one end, the cotton wool plug is pushed down to within $3\frac{1}{2}$ in. of it, 2 to 3 in. of the desiccant, powdered phosphoric anhydride, are added and a second, tight cotton plug is pushed down the tube to hold the desiccant in position. The samples are frozen and individually evacuated for about one minute and then the tube sealed under vacuum with a flame above the desiccant. The tubes are kept in a freezing mixture for two to four hours until dry and sealed again 2 in. above the sample. A special phosphoric anhydride dispenser is described.

Darpoux (H.) & Faivre-Amiot (A.). **Essais d'application des propriétés antagonistes de divers micro-organismes et des substances antibiotiques, dans la lutte contre les maladies des plantes.** [Experiments on the application of the antagonistic properties of various micro-organisms and antibiotic substances, in the control of plant diseases.]—*C. R. Acad. Agric. Fr.*, 36, 4, pp. 158–161, 1950.

Further experiments carried out at Versailles [cf. *R.A.M.*, 28, p. 533] have resulted in the isolation of 256 species and strains of bacteria, actinomycetes, and fungi which secrete substances antagonistic to plant and animal parasites. The

culture liquid of actinomycete 105 [ibid., 27, p. 356] proved antagonistic to *Sclerotinia libertiana* [*S. sclerotiorum*] cultured on sunflower seeds, to the melon wilt organism [*Fusarium bulbigenum* var. *niveum*] in infested soil, and to *Pseudomonas tabacum* inoculated on tobacco seeds. Bacterium BD1 was antagonistic to *S. sclerotiorum* and DB1 to *Alternaria solani* on tomato, the bacterial suspension being sprayed on the aerial parts of the plants, and fungus ML 1050 eliminated *Erysiphe graminis* on barley. Spraying with the culture liquids of various micro-organisms controlled *Podosphaera leucotricha* on apple shoots, *Trichoderma* sp. giving the best results. Three-week-old tumours of *Agrobacterium* [*Bacterium*] *tumefaciens* on tomato measuring 1 cm. in diameter became necrotic after being covered for six days with cotton wool soaked in the culture liquid of *Penicillium* CD2.

It is hoped that these experiments may lead to new methods of controlling plant diseases, using either the antagonistic organisms themselves or the antibiotic substances that they secrete.

Manil (P.) & Straszewska (Zofia). **Action de l'acide dichlorophenoxyacétique (2–4–D) sur les moisissures.** [Action of dichlorophenoxyacetic acid (2,4–D) on moulds.]—*C. R. Soc. Biol., Paris*, 144, 3–4, pp. 313–315, 1950.

In experiments at the Agronomic Institute, Gembloux, Belgium, 2,4–D, at concentrations of 1 in 1,000 and 1 in 10,000, restricted the growth of cultures of *Aspergillus niger*, *Rhizopus oryzae*, *Fusarium dianthi*, and *Penicillium notatum*, while at 1 in 100 it inhibited all development, except that of *A. niger* [see above, p. 575].

Lee (S.). **Laundry resistant antimildew treatment.**—*Amer. Dyest. Reptr*, 39, 5, pp. 145–151, 156, 15 graphs, 1950.

A method has been devised at the Interchemical Corporation, Textile Colors Division, Fair Lawn, New Jersey, and is here fully described, for increasing the permanence of anti-mildew and anti-rot properties of textiles. A water-soluble fungicide, such as copper-8 quinolinolate [*R.A.M.*, 28, pp. 25, 74], is affixed to the textile fibre by resin-bonding. Even after 25 launderings the resistance of treated fabrics is still far superior to that of untreated. Resistance to dry cleaning and to alternate exposures to ultra-violet light and washing is also high. The treatment appears to be equally applicable to vegetable and animal fibres.

Nopitsch (M.). **Ursache und Bekämpfung von Schimmelbefall auf Textilien.** [Cause and control of mould attack on textiles.] *Melliand Textilber.*, 31, 3, pp. 182–188, 11 figs., 1 diag., 1950. [English, French, and Spanish summaries.]

This is a comprehensive account and discussion, in the light of the relevant contemporary literature, of the etiology, predisposing factors, methods of recognition, and control of the moulds attacking textiles. Among those most frequently encountered in the author's work at the Research Institute for Clothing Physiology, Schloss Hohenstein, Germany, are *Rhizopus nigricans* [*R. stolonifer*], *Aspergillus niger*, *A. terreus*, *Mucor mucedo*, *Diplodia cowdelii*, and *Stemphylium*, all forming black to dark brown spots; *Cladosporium herbarum*, '*A. alternatus*', and *Hormodendrum* (brown); *Oidium aurantiacum* [*Monilia sitophila*], *A. flavus*, and *A. ochraceus* (yellow to orange); '*Penicillium glaucum*', *A. glaucus*, *A. versicolor*, *A. fumigatus*, the grape mould (*Botrytis*), and *Polyactis* [*Botrytis*] *fascicularis* (green to olive-green), the last group predominating. Promising results were given by experiments in the protection of various materials by treatment with the heavy metal salts (notably mercury) of aromatic antiseptics.

Johnston (A.). **Vesicular-arbuscular mycorrhiza in Sea Island Cotton and other tropical plants.**—*Trop. Agriculture, Trin.*, 26, 7–12, pp. 118–121, 4 figs., 1949.

A representative sample of the Trinidad flora harboured vesicular-arbuscular

mycorrhiza in 86 per cent. of the 93 species examined [*R.A.M.*, 28, p. 76]. Although common in each of the six ecological habitats surveyed, the proportion of mycorrhizal species and the intensity of infection varied; both were greatest in forest soils comparatively high in organic matter. Mycorrhiza were least common among herbs or shrubs growing as weeds or constituents of regenerating waste land. Two types of endophyte were recognized, distinct in the mode of degeneration of the fungus in the root cells. They are termed 'sporangiolar' and 'intracellular hyphal' types, the latter being commoner in all groups of plants examined except weeds.

Abundant organic matter in the soil was most favourable to the development of mycorrhiza in Sea Island cotton [ibid., 18, p. 796]. A pot experiment showed that mycorrhiza were not essential for growth in young cotton plants, but varied in importance with soil conditions, being beneficial in poor soil and possibly in that rich in organic matter, but with little effect in the presence of plentiful inorganic nutrients and little organic matter.

Darby (R. T.) & Goddard (D. R.). **Studies of the respiration of the mycelium of the fungus Myrothecium verrucaria.**—*Amer. J. Bot.*, 37, 5, pp. 379–387, 8 graphs, 1950.

Studies carried out in the Quartermaster General Laboratories and the University of Pennsylvania Botanical Laboratories, Philadelphia, showed that the rate of respiration in *Myrothecium verrucaria* varied markedly with the age of the culture, the maximum being obtained with those shaken for 20 to 30 hours. In these 80 per cent. of the sugars were assimilated. The fungus is strongly aerobic and respiration was essentially independent of pH between 3 and 8 and was markedly inhibited only at pH 2 or 9·5.

Münster (J.). **Efficacité de quelques méthodes de récolte des plants de Pommes de terre (récolte hâtive) entravant la propagation des maladies à virus et du mildiou.** [Efficacy of some methods of harvesting seed Potatoes (early harvesting) which reduce the spread of virus diseases and blight.]—*Rev. romande Agric., Vitic., Arboric.*, 6, 4, pp. 25–27, 1950.

While the early harvesting of seed potatoes to reduce virus diseases has been compulsory in Switzerland since 1948 [*R.A.M.*, 28, p. 536], 'direct' early harvesting presents certain drawbacks. The tubers are unripe and easily injured, and must therefore be hoed up by hand, an expensive operation; moreover, subsequent loss of weight, even when every care is used in storage, may, one month later, average 20 per cent. or more of the initial weight. In 1948 at Beau-Cèdre (Jouxtens-Mézery), Bintje, Erdgold, and Ackersegen potato plants, apparently completely free from virus diseases, were submitted to (1) 'direct' early harvesting, (2) removal of the haulms only by cutting, and (3) by pulling them off, on 20th July after 98 days' growth. In 1949 the Bintje variety grown from the 'seed' given treatment (1) showed 6·3 per cent. serious virus disease (various forms of mosaic with leaf roll), 7·6 per cent. for treatment (2), and 5 per cent. for treatment (3), while those harvested in the normal way on 17th September had 18 per cent. serious virus disease. The corresponding figures for Erdgold were 7, 24·7, 5·6, and 20·3, and for Ackersegen 3, 4, 0·3, and 12·6 per cent. The development of new shoots after cutting (but not after pulling) served as an ideal medium for insect vectors. Pulling, however, is slow and arduous, and since 1947 the author has carried out tests with various chemicals for destroying the haulms [cf. ibid., 28, p. 480], especially dinitrocresols (alone or with salts) and sodium and calcium chlorates. No chemical treatment tested completely prevented renewed growth without reducing germinative ability. Tubers of plants from which the tops

are pulled increase in weight if left in the ground for three or four weeks afterwards.

The conditions which prevailed locally in 1948 strongly favoured infection by *Phytophthora infestans*. Bintje potato plants subjected to treatments (2) and (3) above and no treatment showed on 20th August 0·4, 0·3, and 13·3 per cent., respectively, infection of the tubers, the corresponding figures on 17th September being 3·3, 1·2, and 20·7 for Bintje and 4·9, 0·3, and 9 for Ackersegen. On the former date Erdgold plants given treatments (2), (3), none, and chemical destruction of the haulms with five different materials [cf. ibid., 29, p. 169] developed, respectively, 0, 0, 0·1, and 0 to 0·3 per cent. infection in the tubers, while on the latter date the figures were 3, 0, 12·9, and 1·4 to 7·4 per cent. Tubers harvested by the 'direct' method on 20th July had no tuber infection. After a month and a half of storage, however, losses from *P. infestans* were 15 to 20 per cent. for Bintje and rather less for the two other varieties. Hence, when infection is severe, direct early harvesting is not to be recommended. The best results were given by pulling the haulms and harvesting the tubers four to six weeks later. Cutting and chemical treatments, especially 3 per cent. sodium chlorate at 1,600 l. per h. and 3 per cent. DNC (M. 116) at 2,000 l. per h., also gave good results.

Hauschild (Irmgard). **Epidemiologische Studien. Mathematische Untersuchungen über die Bedeutung der Infektionsresistenz und Toleranz für die Ausbreitung von Infektionskrankheiten und den Befallsgrad natürlicher Populationen unter besonderer Berücksichtigung der Kartoffelvirosen.** [Epidemiological studies. Mathematical analysis of the significance of infection resistance and tolerance in connexion with the spread of infectious diseases and the degree of infection in natural populations with special reference to Potato viruses.]—*Biol. Zbl.*, 69, 3–4, pp. 103–147, 10 graphs, 1950.

This is a purely theoretical mathematical treatment of the functioning of disease spread. After general introductory remarks on the mathematical treatment of disease spread, equations are given for infection spread from outside in closed populations in the case of (A) permanent infections with transmission to offspring, (B) permanent infections with production of healthy offspring, and (C) temporary infections with and without transmission to the descendants, with consideration in each case of both undiminished and decreased vitality of the diseased hosts.

Under constant conditions (assuming that all the infected hosts and all their derivatives remain infected and possess a vitality equivalent to the healthy ones) infection causes a linear rise of the natural logarithm of the relation between infected and non-infected hosts as time progresses, that is, it is inversely proportional to the resistance to infection ($V = V_0 e^{(a/R)t}$ where R = resistance, a = constant, and e = the base of the natural logarithm, and $V = \frac{K}{1-K}$ where K = proportion of infected plants). Gradually the whole population becomes completely infected.

Decreased vitality of the host leads to a linear fall of this logarithm, inversely proportional to tolerance, so far as this affects the number of infected individuals. If infection exceeds the elimination of diseased hosts, a linear rise results, and *vice versa*, with complete infection in the first case, and complete recovery in the second ($V = V_0 e^{(\frac{a}{R} - \frac{b}{T})t}$ where T = tolerance).

The production of healthy offspring by infected hosts and also the recovery of some of the infected ones results in a slower rate of infection spread and thus complete infection is never attained, but if infection exceeds recovery there is an endemic equilibrium between diseased and healthy hosts. With a highly increased mortality rate of some of the diseased plants and the recovery of others, a complete

recovery occurs if the sum g of both exceeds the infection $\frac{a}{R}$. Recovery occurs more quickly than in case (A).

Virus diseases of potato illustrate the changeable influence of vectors on the spread of infection. For the degree of infection attained in a population only the average vector influence is important and not its fluctuations, so that in all disease-spread equations the vector influence is taken as constant.

Another example treated is the infection spread in an open population from an outside infection source causing permanent infections with transmission to the descendants without recovery. An outside source of infection causes a more rapid disease spread than in a closed population and leads, when the factor of infection exceeds that of elimination, to a much quicker complete infection of the population. Only if the infection influence from the outside source is strong does a complete infection result; complete recovery never occurs.

The disease-spread equations show that in breeding for resistance in order to achieve the lowest possible infection level in a population high resistance must be combined with low tolerance, with this proviso, that low tolerance is valuable only if one succeeds in increasing the resistance and decreasing the tolerance to such a degree that under all conditions the elimination of the diseased individuals exceeds new infections. With such an inherited constitution natural selection gradually results in a complete elimination of a diseased population.

The advantages and disadvantages of high and low tolerance are discussed.

SCHAPER (P.). **Die Krautfäule-Anfälligkeit einiger deutscher Kartoffelsorten 1947–48.** [The blight susceptibility of some German Potato varieties 1947–48.] —*Züchter*, **19**, 8–9, pp. 265–271, 3 figs., 1950.

A review of the existing position in Germany as regards breeding for resistance to potato blight (*Phytophthora infestans*) [*R.A.M.*, 29, p. 226] is followed by a tabulated account of experiments at the Max Planck Institute for Breeding Research, Voldagsen, with an assortment of two groups, viz., (A) comprising 64 *tuberosum* and (B) 10 hybrid varieties. To the first are referred all types derived certainly or with high probability exclusively from the very nearly related *Solanum tuberosum* and *S. andigenum*, and to the second those in the ancestry of which other wild species (in Germany, no doubt, only *S. demissum*) are also concerned. The physiologic race 48/1, used as inoculum on both foliage and tubers, proceeded from a spontaneous field infection of a *S. polycladium* × *S. chacoense* hybrid. In a limited number of tests on tubers only, inoculum was collected from *demissum* × *tuberosum* clones in the field. The tubers were tested in infection chambers maintained at high humidity and approximately optimal temperature. The foliage trials were carried out in the greenhouse on plants before the onset of flowering, and on cuttings of healthy field plants at a comparable stage of growth.

The experimental results as a whole may be summarized as follows. The incubation period (up to the development of typical symptoms) is a characteristic of the individual varieties. In the *tuberosum* group there are no clear-cut correlations between foliage and tuber resistance, the proportion of types with weakly resistant foliage corresponding roughly to those with more strongly resistant tubers. In the assessment of a given variety, therefore, the reactions to foliar and tuber infection should be differentiated. For practical purposes all varieties on which sporangial production following inoculation or natural infection is sparse should be adjudged weakly resistant, while a fair to high degree of resistance may be assigned to those showing slight necrosis and browning but only isolated or no sporangia. On the basis of tests with the obviously weak race 48/1, Ackersegen, Fram, Merkur, Spätrot, Urtica, Voran, and possibly Havilla, may be classified as weakly resistant, and Aquila, Carla, Erika, Falke, Frühnudel, Panther, Pommernbote, Roswitha, and

possibly Monika fairly to strongly resistant. All the weakly resistant varieties belong to the *tuberosum* group and constitute only a small proportion of the susceptible; with one exception (Robusta), all the hybrids are fairly to strongly resistant.

In the limited tests on tubers with the mixed population inoculum, the highly susceptible *tuberosum* types (I), comprising Mensa, Mittelfrühe, Gemma, Vera, and Flava, were uniformly infected by eight populations [ibid., 17, p. 765], so that these varieties cannot be used as differentials. The tubers showed an indefinite, pale browning. The five hybrid varieties of group (II) fall into two sections, namely, (*a*) Falke, Aquila, and Panther, with a variable degree of weak susceptibility expressed by isolated necrotic spots on the tubers; on these three varieties three populations are clearly distinguishable; and (*b*) Frühnudel and Pommernbote, showing varying degrees of stronger susceptibility. The infected tubers are severely damaged, but there is always a sharp line of demarcation between healthy and diseased tissue.

NAVARRO (G.). **Observaciones sobre la producción de Papas en el Uruguay.** [Observations on the production of Potatoes in Uruguay.]—*Rev. Asoc. Ing. agron.*, 21, 86–87, pp. 37–79, 1949.

Among the problems complicating potato production in Uruguay are recurrent epiphytotics of blight (*Phytophthora infestans*), which have assumed a serious character since 1938 [*R.A.M.*, 26, p. 507], and 'degeneration' of virus origin. Important contributions to different aspects of these diseases and their control are summarized and listed in a bibliography of 89 titles, and an account is given of experiments carried out in 1946–7 in connexion with a phytotechnical programme involving the selection and crossing of 26 varieties supplied by the Plant Research and Cold Storage Institute, Nynäshamn, Sweden.

A virulent outbreak of blight permitted the following observations on varietal reactions to the disease. None of the varieties was free from foliar lesions, but a high degree of resistance was manifested by Arran Consul, Ostbote, Ackersegen, Voran, Alpha, Lorch, President, and Parnassia. Kerr's Pink, Koronevsky, and Eigenheimer were resistant. Moderate infection occurred on Katahdin, Gloria, Majestic, El Dorado, Magnum Bonum, and Up-to-Date, while Houma, Early Rose, King Edward, British Queen, Bintje, Goldperle, White Rose, Early Puritan, and Green Mountain were severely attacked. The only varieties showing extensive tuber infection were Voran and Katahdin; Koronevsky, British Queen, Green Mountain, Early Rose, Goldperle, Kerr's Pink, Early Puritan, and White Rose were slightly attacked, and the rest were sound [see preceding abstract].

Observations were also made on the incidence of scab (*Actinomyces scabies*) among the introductions. No lesions were present on British Queen, Up-to-Date, President, Parnassia, Kerr's Pink, Early Rose, King Edward, El Dorado, Bintje, and Ackersegen, and very few on Koronevsky, Magnum Bonum, Ostbote, Houma, Alpha, Goldperle, Voran, and Katahdin. A few tubers of Majestic, Gloria, and Early Puritan showed slight infection, mild generalized infection occurred on Arran Consul, Eigenheimer, and Green Mountain, and intensive generalized infection on Lorch and White Rose.

Voran was the only variety free from symptoms of mosaic, the virus or viruses responsible for which could not be determined. Koronevsky, Alpha, and Voran suffered from a virosis attributed on the basis of its symptomatology to virus Y.

Lesions caused by *Alternaria solani* were observed on Koronevsky, Sequoia, Ostbote, Eigenheimer, and Voran.

PIARD-DOUCHEZ (Y[VONNE]). **Le Spongospora subterranea et son action pathogène.** [*Spongospora subterranea* and its pathogenic action.]—*Ann. Sci. nat., Bot.*, Sér. XI, 10, pp. 91–122, 1 pl., 28 figs., 1949 (published June, 1950).

Studies carried out in France on potato powdery scab (*Spongospora subterranea*)

[*R.A.M.*, 27, p. 151] confirmed the view that penetration of the fungus into the tuber or the root takes place by means of myxamoebae. Invasion by the parasite sets up two forms of reaction in the host tissues, viz., hypertrophy of cells invaded by the plasmodium and hyperplasia at a distance in uninfected cells. Hypertrophy occurs in tuber lesions and in root tumours, but hyperplasia is slight in the tuber although it may be very important in the roots. The effect of the hyperplasia is exerted upon the root cambium, the cells of which multiply actively and form the wood and phloem of which the root tumour largely consists. This accounts for the fact that the root tumours may attain a considerable volume as compared with the root bearing them, though the lesion in the tuber, where hyperplasia is confined to a few cells near the infected area, remains small in comparison with the size of the tuber. The root tumours are malignant and in this respect resemble those caused by *Plasmodiophora brassicae*.

Cytological studies confirmed the presence of a mitosis preceding sporangial formation. In saprophytic culture on agar media numerous amoebae were obtained, one spore giving rise to one amoeba, but not producing plasmodia. On one occasion a body with two nuclei closely resembling a plasmodium was observed in a parasitized cell. The author agrees with Moewus (*Ergebn. Biol.*, 19, pp. 81–142, 1943) that there is as yet no reason to place the Plasmodiophoraceae in the Chytridiales, while there are many reasons for considering them as Myxomycetes.

Menzies (J. D.). **Erysiphe cichoracearum DC. as a parasite of Potatoes.**—*Plant Dis. Reptr*, 34, 5, pp. 140–141, 1950. [Multilithed.]

Since 1946 potato plants in central Washington have been affected by an inconspicuous mildew identified from the perithecia as *Erysiphe cichoracearum* [*R.A.M.*, 20, p. 380; 26, p. 27]. The infection is usually confined to the terminal growth of maturing plants, occurring mostly on the leaf petiole and along the stem [cf. loc. cit.], and causing only a slight superficial russeting late in the season. Mesaba, Warba, White Rose, and Russet Burbank potatoes were infected. It is possible that the fungus, which has not been found on young, vigorous plants, has been present without detection for many years. The same species of mildew occurs locally on many native and cultivated plants, and is especially abundant on *Solanum nigrum* var. *villosum*. This severely mildewed weed often grows among healthy, but susceptible potato plants, which indicates that the potato mildew is a distinct physiologic race.

Moraes (A. de M.). **Uma bacteriose vascular da Batateira (Bacterium solanacearum, E. F. Smith).** [A vascular bacteriosis of the Potato (*Bacterium solanacearum*, E. F. Smith).]—*Agron. lusit.*, 9, 4, pp. 277–328, 4 pl., 1947. [English summary. Received May, 1950.]

Since 1939 the incidence of a bacterial disease of potatoes with symptoms similar to those of brown rot (*Bacterium* [*Xanthomonas*] *solanacearum*), except for the absence of discoloration of the stem tissues, has reached such dimensions in Portugal that virtually no region can be regarded as free of infection, and in some areas the cultivation of the crop is no longer economic. Isolates from various districts agreed in all respects, but differed from *X. solanacearum*, not only in the absence of stem tissue discoloration, but also in the failure of the Portuguese isolates to produce ammonia, their lower temperature range (minimum 8° to 10° C., optimum 27°, maximum 37° to 39°, and lethal 47° to 49°), and narrower host range, embracing neither tobacco nor *Datura stramonium*. It is concluded from these data that all the isolates under observation represent a single strain of *X. solanacearum*, which proved very sensitive to desiccation and also to the acidity of the medium, ranging from pH 4·01 to 4·35. The serological reactions presented

a special type of agglutination, as shown by the optimal ratio of the antigen constant, maximum agglutination occurring at 1 in 80 and 1 in 160.

Inoculation experiments with pure cultures of the organism or planting in infested soil resulted in the decay of potato, *Nicotiana glutinosa*, and tomato. Beans (*Phaseolus vulgaris* and *P. multiflorus*), *Solanum nigrum*, and sunflower reacted by marked stunting. In the case of potato and tomato rotting was preceded by foliar epinasty, accompanied in the latter host by adventitious root formation. None of the 45 commercial potato varieties tested showed any sign of resistance to the bacterium.

A summary is given of the control measures recommended against brown rot, based on information already presented in this *Review*, and comprising use of healthy 'seed', planting in uncontaminated soil, and cultivation of immune or resistant varieties. Where these practices are not feasible, the incidence of infection may be minimized by sterilization of the cutting knives in 1 in 1,000 mercuric chloride, 1 per cent. iodine solution, 5 per cent. commercial formalin, boiling water, or by passage through a flame; immediate eradication of all plants or remnants showing symptoms of the disease; extermination of potential insect vectors; protection of clean soils from contamination by irrigation or rain water from infested areas, or by the use of unsterilized implements; appropriate soil amendments; and proper drainage, avoiding excessive irrigation.

Muller (A. S.). **Report on a seedling Rice disease at Tiquisate, Guatemala C.A.** —*Plant Dis. Reptr*, 34, 5, p. 156, 1950. [Multilithed.]

In January, 1950, an inspection of diseased rice fields (totalling some 60 acres) at Tiquisate, Guatemala, revealed that the one-month-old seedlings were infected with *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: C.M.I. map No. 92; *R.A.M.*, 20, p. 222; 28, p. 641]. Undoubtedly heavily infested seed had been used and the development of the fungus was favoured by weekly irrigation. It is recommended that the crop should be irrigated once a fortnight, nitrogen applied to strengthen weakened plants, and only disinfected seed used. Crop rotation should be introduced.

Szirmai (J.). **A Rizs 'brusone-betegsége', különös tekintettel a hazai vonatkozásokra.** [The 'brusone' disease of Rice, with special reference to Hungarian conditions.]—*Közl. mezögazdas. Tudom.*, 1, pp. 125–145, 11 figs. [undated, received July, 1950. Russian, French, and German summaries].

Two forms of the 'brusone' disease of rice [*R.A.M.*, 29, p. 530] occur in Hungary [ibid., 29, p. 117], where studies on its etiology were carried out from 1940 to 1943. One form, in which the entire crop was devastated by *Piricularia oryzae*, was confined to a single locality (Felgyö), while the other, virtually co-extensive with the cultivation of the host, caused a maximum reduction of 30 per cent. and was associated with infection by a species of *Pseudomonas* distinct from *P. oryzae*, reported from Japan [ibid., 8, p. 460].

Inoculation experiments with the two organisms were performed in the greenhouse and field under conditions both favourable and adverse to the development of infection. The results showed that in a dry, warm atmosphere (20° to 25° C.), *Piricularia oryzae* produced only insignificant local lesions on the inoculated plants, whereas in a humid, cool environment (10° to 15°) it attacked the whole plant, causing typical 'brusone' symptoms [ibid., 27, pp. 255, 445]. *Pseudomonas* sp. too, was pathogenic only under damp, cool conditions, humidity in this case being apparently more important than a low temperature.

Extensive field observations showed that defective aeration of the soil, leading to the retention of stagnant water, was conducive to the development of 'brusone', especially when accompanied by liberal applications of stable manure. In all cases

of the disease, whether generalized or sporadic, facultative parasites were present which could exert their destructive potentialities only on plants weakened in their normal growth by meteorological, physiological, or technical factors.

Schaal (L. A.), Fults (J.), & Garber (R.). **Antibiosis between Actinomyces and other soil fungi.**— Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 1, p. 41, 1949.

Among 30 species of fungi isolated from four Colorado soils, certain species of *Phytophthora*, *Fusarium*, and *Aspergillus* proved to be antagonistic to all the 21 physiologic races of *Actinomyces* tested [cf. *R.A.M.*, 28, p. 418]. Conversely, two of the latter were highly antagonistic to several of the other fungus species. The maximum number of *Actinomyces* races occurred in the soil that had produced potatoes infected by scab [*A. scabies*: ibid., 28, p. 353] just before sampling, and the minimum in a site where the crop was free from the disease.

Michaelson (Merle E.). **Fungicidal effects of synthetic plant hormones on Actinomyces species.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 1, pp. 41–42, 1949.

In tests to ascertain the fungicidal efficiency of 25 synthetic plant hormones of the phenoxyacetic acid type on four physiologic races of *Actinomyces* [see preceding abstract], the organisms were grown at room temperature on modified potato dextrose agar (pH 6·5) containing the chemicals at 11 concentrations. Chemicals of known purity were tested on a molar and the others on a p.p.m. basis. In the former group toxicity of the esters decreased with an increase in the length of the side chain. In the latter pentachlorophenoxyacetic acid was fungicidal at 63 p.p.m.; the cuprous, cupric, and ferric salts at 250 p.p.m.; the calcium, cobalt, and ferrous salts at 500 p.p.m.; and the manganese and magnesium salts at 1,000 p.p.m. Toxicity was augmented by an increase of chlorine atoms in the ring.

Sadasivan (T. S.). **The action of dyestuffs (malachite green) on Pythium aphanidermatum and other soil fungi.**—*J. Indian bot. Soc.* (M.O.P. Iyengar Commemoration Volume), *1946*, pp. 191–195, 1 pl., 1 graph, 1947. [Received June, 1950.]

The fungistatic-fungicidal action of malachite green [*R.A.M.*, 26, p. 184] was tested against *Pythium aphanidermatum*, a destructive pathogen of tomato seedlings [cf. ibid., 25, p. 368], and other soil fungi of Madras. Whereas a dosage of 0·3 p.p.m. of the dyestuff sufficed totally to inhibit the growth of *P. aphanidermatum* on Horne and Mitter's agar medium [ibid., 6, p. 623], a concentration of 1 p.p.m. was necessary to produce a comparable effect on *Trichoderma lignorum* [*T. viride*], 2 p.p.m. for *Aspergillus niger* and *Penicillium citrinum* [ibid., 28, p. 24], while the most resistant species, *Rhizoctonia bataticola* [*Macrophomina phaseoli*], did not succumb until a strength of 6 p.p.m. was reached.

Cooper (W. E.) & Chilton (S. J. P.). **Studies on antibiotic soil organisms. I. Actinomyces antibiotic to Pythium arrhenomanes in Sugar-Cane soils of Louisiana.**—*Phytopathology*, 40, 6, pp. 544–552, 1 fig., 1950.

In this amplified account of studies on the antibiotic properties of Louisiana soil actinomycetes in relation to *Pythium arrhenomanes*, an agent of sugar-cane root rot [*R.A.M.*, 27, p. 297], the number of organisms per gm. of soil, as determined by dilution cultures, is given as 100,000 to 4,000,000, with an average of 1,300,000. Based on 8,302 cultures isolated from 181 samples of five soil types, the percentage of isolates antibiotic to *P. arrhenomanes* ranged from 18·5 to 31·5 per cent. for the different soil types and the zones of growth inhibition from a trace to 41 mm. The average inhibitory activity of the actinomycete populations increased *pari passu* with the pH of the soil samples up to 7·5, beyond which there was a slight fall.

The number of actinomycetes in contact with the roots considerably exceeded that in the surrounding soil.

Langdon (R. F. N.). **Records of Queensland fungi, VI.**—*Pap. Dep. Biol. Univ. Qd*, 2, 13, pp. 15–18, 1950.

This is a further list of fungi not previously recorded in Queensland [cf. *R.A.M.*, 29, p. 278] with additions to host ranges and fungus distribution. *Entomosporium maculatum* [*Fabraea maculata*: ibid., 25, p. 185] was the cause of severe leaf spotting and defoliation of pear stocks at Stanthorpe in 1948.

Greene (H. C.). **Fungi of the University of Wisconsin Arboretum.**—*Trans. Wis. Acad. Sci., Arts Lett.*, 39, pp. 47–82, 1949.

This is an alphabetical list of 795 species of fungi collected in the University of Wisconsin arboretum during the years 1942 to 1946. It includes 77 new records for the State. About 615 of the fungi are parasites [*R.A.M.*, 28, p. 594].

Arentsen (S.). **Algunos hongos de Cautín.** [Some fungi of Cautín.)—*Agric. tec., Chile*, 9, 1, pp. 84–86, 1949.

Among the fungi collected in the province of Cautín, Chile, in January, 1949 [cf. *R.A.M.*, 23, p. 254], may be mentioned *Puccinia graminis*, *P. triticina*, and *P. glumarum* on wheat; *P. graminis* on *Avena fatua*; *P. coronata* on *Holcus lanatus*; *P. menthae* [ibid., 25, p. 232] on *Mentha citrata*; *Micronegeria fagi* on *Nothofagus obliqua*; *Venturia inaequalis* on apple; *V. pirina* on pear; *Cryptostictis lapageriicola* on *Lapageria rosea*; *Sphaceloma populi* [ibid., 23, p. 462] and *Taphrina aurea* [ibid., 25, p. 578] on poplar (*Populus nigra* var. *italica*); *S. rosarum* [ibid., 25, p. 560] and *Sphaerotheca pannosa* on rose; and *Peronospora effusa* [ibid., 29, p. 244] on *Chenopodium album*.

Shaw (C. G.). **Article 57.**—*Mycologia*, 42, 2, pp. 325–330, 1950.

In discussing Article 57 of the International Rules of Nomenclature [cf. *R.A.M.*, 27, p. 499; 28, p. 546] the author expresses the view that a description of a fungus has greater permanency than the original specimen. He considers that names given to anything, other than descriptions of the perfect states of pleomorphic fungi, whether or not the perfect state was present in the type material, are *nomina provisioria*, for example, *Milesia* F. B. White as published was a *nomen provisiorium*.

Cunningham (G. H.). **New Zealand Polyporaceae. II. The genus Irpex.**—*Bull. Dep. sci. industr. Res. N.Z.* 82, 8 pp., 4 figs., 1949.

The author in continuation of his studies on the New Zealand Polyporaceae [cf. *R.A.M.*, 29, p. 122] treats the genus *Irpex* as a member of the family close to *Polyporus*, because of the monomitic or dimitic hyphal systems. Three species are described.

Nečásek (J.). **On the variability of the spores of higher fungi.**—*Stud. bot. čechosl.*, 11, 1–2, pp. 49–64, 1 graph, 1950.

In biometrical studies carried out at the Charles University, Prague, the author observed that the spores of *Coprinus fimetarius* [*C. cinereus*] grown in pure culture at room temperature were significantly shorter when fruit bodies 1 to 1·5 cm. long were kept in darkness, when the cultures were infected with a species of *Penicillium*, or when the fruit bodies developed in red light. Close under the limit of significance lay the mean lengths of the spores of fruit bodies from cultures infected by myxomycetes (*Stemonitis* sp.) and of those grown at 30° C. Significant differences were observed in exceptionally small fruit bodies.

Ito (S.) & Murayama (D.). **On the species of Uredinales in Japan and her adjacent areas.**—*Ann. phytopath. Soc. Japan*, 13, 3–4, pp. 33–36, 1949. [Japanese. Received May, 1950.]

This is a tabulated summary of the numbers of species and genera of the Uredinales found in Japan and her adjacent possessions.

Florenzano (G.). **Studi sul genere Chaetomium.** [Studies on the genus *Chaetomium*.]—Reprinted from *Boll. Ist. Pat. Libro, 1948*, 23 pp., 6 pl., 1948. [Received June, 1950.]

The author presents a brief critical review of the literature dealing with the genus *Chaetomium* [cf. *R.A.M.*, 13, p. 256; 16, p. 838; 25, p. 527; 29, pp. 323, 474]. In his opinion the genus is inadequately defined, and he examines in detail those characters which are important from a diagnostic point of view. The morphological characters of the perithecia and particularly the system of hairs should be taken as a basis for the determination of the genus. An amended Latin diagnosis of the genus is presented. The species described (28) are arranged in four groups, according to the morphological characters of the mature perithecium, group 1 having as its typical species *C. globosum* and *C. ochraceum*; group 2, *C. spirale* and *C. crispatum*; group 3, *C. bostrychodes* and *C. capimum*; and group 4, *C. elatum* and *C. cuniculorum*. A key for the determination of the species is provided.

Lamb (J.). **A report on blister blight disease in Ceylon Tea plantations.**—*Tea Quart.*, 20, 3–4, pp. 149–159, 1949.

In this report on tea blister blight [*Exobasidium vexans*: *R.A.M.*, 29, p. 385] in Ceylon the author succinctly reviews the history of the disease and its effect on the industry, describes the work of the Tea Research Institute, and gives recommendations for future research on control. At present the disease is responsible for a loss of over 5 per cent. of the total tea production of Ceylon. Work by the Tea Research Institute on the exact nature and cause of the disease has been completed, small scale experiments on control by spraying have already been made, and large-scale experiments to check the results are awaited. The author recommends the establishment of a Crop Protection Section of the Institute to deal with the development of spraying and dusting machines and field experiments generally.

Giovannozzi (M.). **L'industria del Tabacco al VII Congresso Internazionale delle Industrie Chimico-Agrarie.** [The Tobacco industry at the seventh International Congress of the chemical-agricultural industries.]—*Tabacco*, 53, 597, pp. 120–125, 1949.

The following contributions, read at the seventh international Congress of chemical and agricultural industries, Paris, 1948, may be noted: Mira E. Alcarez (Spain) deals with the development of tobacco varieties resistant to tobacco mosaic virus [cf. *R.A.M.*, 27, p. 64; 28, p. 250]. Resistant varieties obtained by crossing the resistant Ambalema with the chief varieties grown in Spain are listed as follows: 'hybrid 60' (Ambalema × Filippino), 'hybrid 61' (Ambalema × Kentucky), and, more recently, 'hybrid 230–B' (hybrid 60 × Filippino), 'hybrid 224' (hybrid 60 × hybrid 217), 'hybrid 225' (hybrid 60 × hybrid 216), and 'hybrid 226' (hybrid 60 × Cantabria). Notes are given on the natural infection occurring on them.

J. L. Cuzin and D. Schwartz (France) describe statistical methods of studying the epidemiology of tobacco mosaic in the field [ibid., 28, p. 87].

Anderson (P. J.). **Pole rot of Tobacco.**—*Bull. Conn. agric. Exp. Sta.* 517, 19 pp., 6 figs., 1948. [Received May, 1950.]

The term tobacco 'pole rot' [*R.A.M.*, 23, p. 45] includes all types of rot that damage the leaves hanging on poles in the curing sheds, namely stalk, vein, web,

and freckle rot. Most of the rot is caused by *Sclerotinia sclerotiorum* and *Botrytis cinerea*, which is virulent on the green parts, and together these organisms appear to be responsible for most if not all the serious outbreaks of pole rot in Connecticut. Freckle rot caused by *Alternaria tenuis* [ibid., 16, p. 21] is the type of least importance.

Pole rot may be controlled completely by firing for a long period at a high temperature (85° to 95° F.), but overfiring must be avoided. Proper distribution and volume of air currents should be maintained in the sheds by means of electric fans. Growers are advised to practise initial 'firing to wilt' which causes the plants to separate so that there is less chance of the rot passing by contact from one to another. This process also dries out the bruised areas on stems and leaves, which form infection foci for rot fungi. Since rot is usually most severe in tobacco nearest the floor, leaves on the first tier should be hung so that the tips are five or six feet from the ground. Stalk-cut tobacco should be left in the field three weeks after topping until it is 'ripe'; it is best that leaves should be dry when hung. All leaves bearing spots should be discarded.

Braun (A. C.). **The mechanism of action of a bacterial toxin on plant cells.**—*Proc. nat. Acad. Sci., Wash.*, 36, 8, pp. 423–427, 1 fig., 1950.

In studies made at the Rockefeller Institute for Medical Research, New York, the bacterial toxin associated with the wildfire disease of tobacco (*Pseudomonas tabacum*) [*R.A.M.*, 17, p. 274] was shown to exert its biological effect by interrupting the methionine metabolism of the plant cells. The inhibitory influence of the toxin on the growth of *Chlorella vulgaris* was completely reversible in the presence of *l*-methionine. Although a similar reversal has not yet been accomplished in tobacco, the mechanism of action may be similar in the latter since methionine sulphoximine, a known methionine antagonist, produced chlorotic lesions in tobacco leaves that were indistinguishable from those produced by the bacterial toxin.

Clayton (E. E.). **Wildfire disease of Tobacco and Soybeans.**—*Plant Dis. Reptr*, 34, 5, pp. 141–142, 1950. [Multilithed.]

The results of field inoculation experiments at the United States Division of tobacco, medicinal, and special crops during 1947, 1948, and 1949, with *Pseudomonas tabaci* [*P. tabacum*: *R.A.M.*, 28, p. 25] isolated from tobacco plants demonstrated that the isolates caused regular heavy infections on various types of tobacco but none of 13 varieties of soy-bean. An isolate from soy-beans [ibid., 28, p. 154] caused no infection on tobacco and only a slight one (in 2 out of 22 tests) on soy-beans.

Hopkins (J. C. F.). **Mosaic 'scorch' in Tobacco.**—*Rhod. agric. J.*, 47, 2, pp. 102–105, 2 pl., 1950.

Under exceptional conditions of drought in Rhodesia during 1948–50 the lower leaves of tobacco plants infected by mosaic virus have been 'scorched' or 'burned'. The leaf turns yellow, and the affected areas dry out and become reddish brown. Mottling was often present in apparently healthy plants, which developed 'scorching' only in the very youngest leaves or in suckers after topping. Plants uninfected by mosaic growing under the same conditions or where there was adequate rainfall did not develop any signs of injury. Care should be taken at topping time to see that plants do not become infected. Mosaic control measures are given [*R.A.M.*, 21, p. 430].

Minges (P. A.), Kendrick (J. B.), Spurlock (J. E.), & Holmberg (D. M.). **Tomato propagation.** –*Circ. Calif. agric. Ext. Serv.* 160, 30 pp., 18 figs., 3 graphs, 1950.

On pp. 16–19 of this publication brief, practical notes are given on the symptoms and control of the principal diseases occurring in tomato beds in California.

Tomatoes. Cultivation, diseases, and pests.—*Bull. Minist. Agric., Lond.*, 77, iii+56 pp., 12 pl., 1 diag., 1950. 2*s.* 6*d.* net.

This third edition of the present bulletin, first published in 1934 [*R.A.M.*, 21, p. 103], has been revised by the Glasshouse Group of Specialist Advisers of the National Agricultural Advisory Service under the chairmanship of Dr. W. F. Bewley, the original author. The section on diseases (pp. 40–44) in addition to the earlier matter includes practical notes on cucumber mosaic virus [ibid., 26, pp. 372, 535; 29, p. 140], magnesium deficiency [ibid., 27, p. 49], and bronzing associated with some irregularity in the water supply [ibid., 13, p. 663].

Goidànich (G.), Diotallevi (Z.), & Marimpietri (L.). **Il 'marciume apicale' del Pomodoro 'San Marzano'.** ['Apical rot' of the 'San Marzano' Tomato.]—*Ital. agric.*, 84, pp. 637–643, 1947. [Abs. in *Boll. Staz. Pat. veg., Roma*, Ser. 3, 5, pp. 137–138, 1947 (published 1950).]

In central and southern Italy tomatoes of the San Marzano variety are seriously affected by an apical fruit rot. In east central Italy and between Rome and Naples the disease is of the physiologic type. The pathological process leading to the formation of the apical lesions may begin externally at the stylar residues and spread internally or it may start in the placentae, which are atrophied, and spread to the external layers of the pericarp. The lesions may be very small or they may involve more than half the surface of the fruit. All affected tomatoes become subject to secondary infection by species of *Fusarium*, *Geotrichum*, and bacteria. Experimental evidence conclusively demonstrated that one of the chief factors inducing the condition is disturbance in the water-relations of the plants.

Luttrell (E. S.). **Botryosphaeria stem canker of Elm.**—*Plant Dis. Reptr*, 34, 5, pp. 138–139, 1950. [Multilithed.]

In the spring of 1944 at Experiment, Georgia, a three-year-old potted American elm plant developed a black, depressed canker near the base of the stem soon after the leaf buds opened, resulting in the death of the upper part of the plant. Pycnidia were produced in the canker and on the dead stem, and the following spring ascocarps typical of *Botryosphaeria ribis* [*R.A.M.*, 27, p. 409; 28, p. 365; and below, p. 589] were present. Similar ascocarps developed on elm twigs inoculated from the cankered tissue and overwintered out of doors. Inoculations with conidia from cultures reproduced the disease.

The cankers caused by *B. ribis* were 1 to 4 cm. long, and often coalesced. Larger cankers girdled the stem. The older ones were black to dark brown with a raised tan margin, and the surface of some was brown to tan; old cankers were raised and fissured. The part of the stem above severe cankers died and became covered with erumpent pycnidial stromata, but uninfected branches below the canker continued growth, and new shoots developed at the soil line, the plant ultimately recovering.

The roughly spherical pycnidia were formed in the bark throughout the year, were often separate, but usually grouped on a plectenchymatous stroma; they measured 163 to 353 μ in diameter. The hyaline, non-septate, fusiform conidia were rounded at the ends, and measured 22·4 to 30·8 by 4·2 to 7·6 μ. During late winter and early spring stromata containing microconidial locules and the initials of ascigerous locules developed in the dead stems. The mature, spherical, ascigerous locules measured 245 to 286 μ in diameter. The hyaline, non-septate, oblong to fusiform ascospores measured 19·6 to 28 by 8·4 to 11·8 μ [cf. ibid., 27, p. 410].

Cultures from the tissue of the original canker and from ascospores discharged on to agar were similar, the fungus producing a fluffy grey to black mycelium on malt agar. All isolates produced pycnidia when grown on sterilized elm twigs. Three-month-old elm seedlings inoculated in June showed cankers at the end of

October, when some of the plants died back. One year after the inoculation all inoculated plants were infected, but only 50 per cent. had died back. Infections resulting from inoculations with conidia were more severe than those with mycelium.

Although the disease has not been observed on elm in the field, it may become a menace in the nurseries.

Milbrath (D. G.). **Oak wilt.**—*Bull. Dep. Agric. Calif.*, 39, 2, pp. 64–69, 4 figs., 1950.

To facilitate early recognition, should oak wilt (*Chalara quercina*) [*R.A.M.*, 29, pp. 339, 544] spread to California, a brief description is given of the causal organism and symptoms, with a list of the native and presumably introduced oaks growing in California, those already found susceptible in Middle-Western States being indicated.

Bryce (J.). **Watermark disease of Willows.**—*Essex Fmrs' J.*, 28, 12, p. 24, 1950.

Watermark disease [*Erwinia salicis*] of cricket-bat willows [*Salix coerulea* and other *S.* spp.: *R.A.M.*, 20, p. 3: 29, p. 542] is known to occur in Essex, Suffolk, Hertfordshire, Norfolk, Cambridgeshire, Middlesex, Gloucestershire, Wiltshire, and Yorkshire. Spread is effected by two methods, namely, through the air from tree to tree by agents as yet unknown and by setts used for propagation. Aerial dissemination can be counteracted only by the destruction of diseased trees. Transmission through the setts may be reduced to a minimum by the exclusive use of healthy stock and regular, close inspections of the beds and neighbouring trees.

Heim (R.) & Bouriquet (G.). **Une maladie chancreuse de l'Aleurites à Madagascar.** [A cankerous disease of *Aleurites* in Madagascar.]—*Rev. Path. vég.*, 27, 1, pp. 3–13, 5 figs., 1948. [Received May, 1950.]

In November, 1940, *Aleurites fordii* trees at Imérimandroso, near Lake Alaotra, Madagascar, were observed to bear pustule-like, cracked cankers on the branch extremities, the progress of which modified the tropism of the young branches and finally killed them. In 1941 the same disease was observed in the Itasy at Analovory. The most serious damage was observed in September, 1945, in a neglected plantation at Saovinandriana at a height of 1,600 m.

Diseased material from all three localities harboured a *Septobasidium* sp. parasitizing the coccid insect *Hemiberlesia lataniae* and also to a lesser extent *Aonidiella aurantii*. The fungus is designated as *S. aleuritidis* n.sp. The disease is attributed principally to the former insect.

Prasad (J.). **Aleurites fordii, Hemsl.**—*Indian For. Rec.*, N.S., Silvicult., 8, 1, 33 pp., 2 pl., 1950.

On p. 19 it is stated that a *Macrosporium* sp. causes brown leaf spot of tung trees (*Aleurites fordii*) in India towards the end of the summer. *Clitocybe tabescens* [*R.A.M.*, 23, p. 504] is the cause of root rot which may spread to neighbouring trees if those affected are not promptly removed.

Paclt (J.). **O chorobné skvrnitosti listů Pavlonie císařské.** [Leaf spotting of the Empress *Paulownia*.] –*Ochr. Rost.*, 21, 3–4, pp. 34–37, 1 fig., 1948. [Received July, 1950.]

The leaves of *Paulownia tomentosa*, growing in a park in Prague, Czechoslovakia, exhibited conspicuous spotting in the autumn [? of 1947], due to *Ascochyta paulowniae*. The irregular lesions (sometimes more than 2 cm. in diameter) were first dark yellowish-brown, later turned greyish-brown or grey, and were often surrounded by a darker margin. The characteristic, pale olive-green, two-celled, slightly

constricted, spindle-shaped spores measured 15 by 3 μ (average). The author briefly compares the fungus with two other leaf pathogens of *P.* sp., namely, *Phyllosticta paulowniae* and *Septoria paulowniae*, and presents a list of 17 parasites and saprophytes previously reported on this host.

Hepting (G. H.) & Toole (E. R.). **Some southeastern tree diseases—1948 and 1949.**—*Plant Dis. Reptr*, 34, 5, pp. 135–137, 1950. [Multilithed.]

A list is given of tree diseases investigated by the office of the Division of Forest Pathology, Asheville, North Carolina, in south-eastern United States in 1948 and 1949. Those most commonly reported in 1948 were hemlock (*Tsuga canadensis*) twig rust (*Melampsora farlowii*) [*R.A.M.*, 18, p. 719], wilt of mimosa (*Albizzia julibrissin*) (*Fusarium oxysporum* f. *perniciosum*) [ibid., 29, p. 66], white pine (*Pinus strobus*) blight of unknown etiology [ibid., 29, p. 235], needle cast of loblolly pine (*P. taeda*) caused by *Hypoderma lethale* and ?*Lophodermium* sp. [ibid., 28, p. 595], little leaf of shortleaf pine (*P. echinata*) [ibid., 29, pp. 65, 187], pitch canker (*F. lateritium* f. *pini*) [loc. cit.] and fusiform rust (*Cronartium fusiforme*) of slash pine (*P. caribaea*) [see next abstract], and pitch canker of Virginia pine (*P. virginiana*). The more prevalent diseases in 1949 included mimosa wilt, [unspecified] oak dying-off, white pine blight (three cases compared to 16 in 1948), little leaf of shortleaf pine, canker (*Botryosphaeria ribis*) of *Cercis canadensis* [ibid., 20, p. 327], root and heart rots of red cedar (*Juniperus virginiana*) due to *Fomes annosus* and *F. subroseus*, respectively, and sycamore (*Platanus occidentalis*) anthracnose (*Gnomonia veneta*) [ibid., 20, p. 611; 28, p. 38], the incidence of which has greatly increased.

Hedgcock (G. C.) & Siggers (P. V.). **A comparison of the Pine-Oak rusts.**—*Tech. Bull. U.S. Dep. Agric.* 978, 30 pp., 1949.

This is a detailed, fully tabulated report of a comprehensive study, initiated in 1908, of the host relationships and comparative morphology of five species of pine-oak rust, one of which, *Cronartium fusiforme*, is becoming a serious obstacle to the successful growth of slash and loblolly pine (*Pinus caribaea* and *P. taeda*) in some localities of the United States [*R.A.M.*, 29, pp. 185, 238]. In 1938–9 nursery losses of these species ranged from 10 to 35 per cent., and since 1937 over 10,000,000 infected seedlings have been culled. Damage to plantations is also severe in areas where the alternate oak hosts are abundant and weather conditions favour infection. The taxonomic differentiation of the several species of rusts involved is necessary for the development of practical control measures.

J. C. Arthur [ibid., 13, p. 728] referred all species of the pine-oak rusts to *C. quercuum*, but the writers dissent from this view and regard the four American species, *C. cerebrum*, *C. fusiforme*, *C. conigenum*, and *C. strobilinum*, as distinct from each other and from *C. quercuum* [ibid., 19, p. 173]. The geographical distribution of *C. cerebrum* on pine extends in eastern North America from Minnesota eastwards through Canada and south to the Gulf of Mexico and eastern Texas. *C. fusiforme* is most prevalent in coastal States from the Eastern Shore of Maryland to Florida and Texas. The range of *C. conigenum* is not well defined, but the species is known to occur in the mountains from Arizona through Mexico and Guatemala. *C. strobilinum* is found in the south-east, from eastern North Carolina and Florida west along the Gulf coast to south-eastern Louisiana. *C. quercuum*, indigenous to China and Japan, is not known to occur in the United States. The hosts of each species are listed. Field observations suggest that *C. strobilinum* overwinters in the uredo state on young oak stems, particularly of the sprout type, far north of the range of its aecidial hosts, *P. caribaea* and *P. palustris*.

The inoculation of pines with aecidiospores of the American rusts were negative, proving these species to be heteroecious. No experiments were performed with

C. quercuum, which has also, however, been reported to be heteroecious. As a group, the black oaks were more susceptible than the white to infection by *C. cerebrum* and *C. fusiforme*, whereas the white were particularly prone to attack by *C. strobilinum* and slightly more susceptible than the black to *C. conigenum*. Inoculations with sporidia of *C. cerebrum* and *C. fusiforme* from teleutosori grown on oak leaves in the greenhouse from authentic material produced only spheroid and fusiform galls, respectively, on pine seedlings.

C. cerebrum formed pycnia in the first spring after inoculation and aecidia in the second. Some seedlings inoculated with *C. fusiforme* showed pycnia late in the autumn of the year of inoculation and aecidia in the following spring. Thus, the periodicity of pycnial and aecidial fruiting of *C. cerebrum* and *C. fusiforme* was biennial, but the time elapsing before fruiting may be one growing season shorter for the latter species. *C. conigenum* also formed pycnia and aecidia biennially in contrast to the annual production of these organs by *C. quercuum* and *C. strobilinum*. The season of pycnial fruiting also varies between the species. Pycnia of *C. cerebrum* are formed from December to June, of *C. fusiforme* from October to April, of *C. quercuum* from December to February, of *C. conigenum* in May and June, and of *C. strobilinum* in March and April.

Interspecificity was indicated by the cross-inoculation results. *P. virginiana* proved highly susceptible to *C. cerebrum* and resistant to *C. fusiforme* and *C. strobilinum*. Other species of pines infected by *C. cerebrum* and apparently resistant to *C. fusiforme* were *P. banksiana*, *P. clausa*, *P. densiflora*, *P. echinata*, *P. gerardiana*, *P. glabra*, and *P. pinaster*. Approximately 35 and 40 per cent. of the seedlings died as a result of inoculation with *C. cerebrum* and *C. fusiforme*, respectively. *C. cerebrum* does not spread appreciably from branch to trunk, whereas the cankers of *C. fusiforme* often extend from the original focus of infection to the adjacent trunks and branches. They girdle the tree and are much more lethal than those of *C. cerebrum*. Pine seedlings inoculated with *C. conigenum* and *C. strobilinum* developed small galls near the needles, the latter species killing 55 per cent. of the infected plants in a year. *C. strobilinum* in the south-east and *C. conigenum* in the south-west destroy first-year cones and thereby reduce the amount of pine reproduction.

Both similarities and differences were revealed by a study of the comparative morphology of the five rusts. The closest resemblance is between *C. cerebrum* and *C. fusiforme*, but they are distinct in their gall forms. The galls of *C. cerebrum* and *C. quercuum* are uniformly spheroid, while those of *C. fusiforme* are always elongated and usually fusiform. The aecidia of *C. cerebrum* and *C. fusiforme* are cerebroid and those of *C. quercuum* irregularly hemispherical. These three species attack woody tissue in nature, whereas *C. conigenum* and *C. strobilinum* are restricted to first-year cones. The former has erumpent, hemispherical aecidia with side walls, while those of the latter are submerged, vestigial, and without side walls. Within the same species, the different spore types are easily identifiable by size and shape, but interspecific comparison of aecidio- or uredospores usually shows overlapping in the spore dimension range.

WENGER (K. F.). **The mechanical effect of fusiform rust cankers on stems of Loblolly Pine.**—*J. For.*, 48, 5, pp. 331–333, 2 figs., 2 graphs, 1950.

A study of cankered (*Cronartium fusiforme*) [see preceding and next abstracts] loblolly pines [*Pinus taeda*] in the Santee Experimental Forest showed that a tree with 55 per cent. of the stem circumference cankered would withstand the wind velocities (25 m.p.h.) usually encountered in Charleston, South Carolina. A tree is safe to leave provided the canker is not likely to grow beyond 55 per cent. between cuttings. A canker of this size increases by 1·64 per cent. in one year. Trees with 40 and 47 per cent. canker cannot be left more than 5 and 10 years, respectively.

Lindgren (R. M.). **Damage from heavy fusiform cankering in '49 can be reduced.** —*For. Fmr*, 9, 4, p. 9, 3 figs., 1950.

Warm weather in late winter followed by cool damp conditions in April, 1949, prevailed over extensive areas of the Gulf States of the United States and favoured infection of pines by fusiform rust [*Cronartium fusiforme*: see above, p. 589]. From 20 to 25 per cent. of the slash pine [*Pinus caribaea*] and loblolly pine [*P. taeda*] seedlings in some nurseries and 30 per cent. or more of the trees in young field plantings, hitherto relatively rust-free, have become infected. All seedlings with abnormal swellings along the stem should be discarded. Plantations and natural stands five years old or less should be carefully examined for slight swellings on the branches and stems. If 25 to 30 per cent. of the trees in plantations show young cankers the infected branches should be removed; this also applies to young natural stands with fewer than 700 trees per acre. Only trees free from stem cankers should be pruned. All infected but no healthy branches should be removed. Severed infected branches may be left lying where they fall. To ensure the best results, the infected branches should be removed before tree growth starts in the spring.

The effectiveness of this type of pruning will be affected by the age of the trees and the relative amounts of branch and stem cankering. The least benefit can be expected in one-year-old stands, in which almost all the 1949 infections are already in the stems. In two-year-old stands from one-third to one-half of the new infections will probably be confined to the branches, so that large numbers of trees in severely affected stands can be saved by pruning. A progressive decrease in the proportion of 1949 infections that have reached the stem will be found in three-, four-, and five-year-old plantations, and pruning trees which have not become stem-cankered from previous infections will largely protect such trees from developing cankers in the spring of 1949.

Latour (J. M.). **Intervention de la gelée dans la formation du chancre du Mélèze d'Europe (Larix decidua Miel.).** [The part played by frost in the formation of canker of European Larch (*Larix decidua* Miel.).]—*Bull. Soc. for. Belg.*, 57, 6, pp. 239–241, 1950.

Observations on larches made, for the most part, in the arboretum at Groenendaal, Belgium, indicated that the abnormal tissue formations found in cases of canker (*Dasyscypha willkommii*) [*R.A.M.*, 27, p. 544; 28, pp. 93, 656; 29, p. 187] were anatomically identical with those apparently due to frost [ibid., 29, p. 544]. The wood parenchyma showed simple pitting, there were abnormal tracheids of three kinds, and widening and bending of the medullary rays. The cankers also showed cup-shake and necrosis identical with what is found in cankers due to frost. The author, employing Langner's method, confirmed his observation that the mycelium of *D. willkommii* colonizes only dead cortical tissues [ibid., 15, p. 693]. It is concluded that frost plays an important part in the formation of larch cankers and *D. willkommii* is not the sole cause of them.

Blew (J. O.). **Wood preservatives.**—*Rep. For. Prod. Lab., U.S. Dep. Agric.* R149 (revised), 12 pp., 1949. [Mimeographed.]

Two classes of wood preservatives are described: oil-borne preservatives [*R.A.M.*, 29, pp. 1, 189] and water-borne salts [ibid., 29, p. 444]: their uses and value are discussed [cf. ibid., 29, p. 69].

Bagchee (K.) & Bakshi (B. K.). **Some fungi as wound parasites on Indian trees.**—*Indian For.*, 76, 6, pp. 244–253, 5 pl., 37 figs., 1950.

This paper reports pathological studies of *Polyporus gilvus* [*R.A.M.*, 5, p. 199; 24, p. 213; 28, p. 148; 29, p. 238], *Ganoderma lucidum*, *G. applanatum*, *Fomes*

badius, *F. rimosus* [ibid., 17, p. 635; 23, p. 418], *F. senex* [ibid., 26, p. 410], and *F. pini* found on various trees in avenues, parks, and forests in India which had been submitted to different forms of maltreatment by villagers to get fuel or fodder. Descriptions of the pathogens in nature and in culture are given.

P. gilvus is commonly present in the hardwood forests in the plains of India and is parasitic on *Shorea robusta*, *Dalbergia latifolia*, *Pterocarpus marsupium*, *Albizzia procera*, *Terminalia catappa*, and *Cassia javanica*; in the temperate Himalayas it also occurs as a parasite or saprophyte on oak. *G. lucidum* [ibid., 26, p. 410] causes much damage to hardwoods, including *Poinciana regia*, *Azadirachta indica*, *Morus alba*, *Acrocarpus fraxinifolius*, and *Cassia javanica*; it has also been observed on *C. siamea* and *Pongamia glabra*. *G. applanatum* [ibid., 27, p. 260] attacks living trees of shisbam [*Amerimnon* spp.], babul [*Acacia* spp.], bamboo, *Cedrela toona*, *Artocarpus integrifolia* [*A. integer*], *Mallotus philippinensis*, and *Cinnamomum cecidodaphne*. *F. badius* appears to be specific on babul, khair (*Acacia catechu*) and *A. sundra*, and has been recorded in all parts of India where these trees are found. *F. rimosus*, common all over India, is a facultative parasite on *Terminalia belerica*, *T. tomentosa*, *Anogeissus latifolia*, *Lagerstroemia parviflora*, and *Elaeodendron glaucum*; it is also a slash-decaying organism. *F. senex* is a wound parasite on avenue trees, such as *Melia azedarach* and *Morus* spp., while it has also been recorded on *Chickorassia* [*Chukrasia*] *tabularis*, *Aesculus indica*, *Mimusops elengi*, plum, peach, *Pyrus pashia*, and other hardwoods. *F. pini* [ibid., 4, p. 74] causes a serious heart-rot of *Pinus excelsa* [*P. wallichiana*] in the Hazara division of the North-West Frontier Province and in the Simla, Bashahr, and Kulu divisions of the Punjab. It has also been recorded on *Cedrus deodara*, *Pinus longifolia*, and *Abies pindrow*.

The only feasible way of stopping the uncontrolled lopping of trees, under the conditions at present prevailing in India, would be to grow fodder trees in special areas in the neighbourhood of villages, at first managed by the State and later handed over to the village community.

ANDERSON (A. B.). **Durability of Western Red Cedar heartwood.**—*Wood, Chicago*, 4, 10, pp. 38–41, 1949. [Received May, 1950.]

The author reports the isolation and identification at Madison, Wisconsin, of phenols from heartwood of western red cedar (*Thuja plicata*) [*R.A.M.*, 9, p. 216; 22, p. 460; cf. 29, pp. 340, 447] and their toxicity to *Lenzites trabea* and Madison 517 [ibid., 24, p. 299]. These compounds have been named recently thujaplicin (ERDTMAN (H.) & GRIPENBERG (J.).—*Nature*, 161, p. 719, 1948). The growth of either fungus was inhibited by 5 to 10 ml. of a distillate from western red cedar sawdust. When the distillate was separated into the acid, phenolic, and neutral fractions, 10 ml. of the phenolic fraction killed the fungus, while 50 ml. of either of the other two did not retard growth.

HUFFMAN (J. E.). **Treated timber in the coal mining industry—its application and economic justification.**—*J. For.*, 48, 5, pp. 325–328, 4 figs., 1950.

One of the chief factors increasing the expense of mine roof supports in the United States is the accelerated decay rate due to the use of second growth timbers with much sapwood. All permanent timber should be treated for safety and stability [*R.A.M.*, 22, p. 189]. The preservatives most commonly used by the coal industry are creosote, chromated zinc chloride, Wolman salts [ibid., 26, p. 368; 28, pp. 100, 101], and osmosalts. The estimated cost of treated timber per 1,000 ft. for 12 years' service is $200 compared with $560 for untreated timber, allowing for three renewals. About 15 per cent. of the timber used annually in the coal industry is classified as permanent and should be treated. Only about 10 per cent. is actually treated.